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## Bird Conservation Strategy for Bird Conservation Region 10 Pacific and Yukon Region: Northern Rockies

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## **Preface**

Environment Canada (EC) led the development of all-bird conservation strategies in each of Canada's Bird Conservation Regions (BCRs) by drafting new strategies and integrating new and existing strategies into an all-bird framework. These integrated all-bird conservation strategies will serve as a basis for implementing bird conservation across Canada, and will also guide Canadian support for conservation work in other countries important to Canada's migrant birds. Input to the strategies from EC's conservation partners is as essential as their collaboration in implementing their recommendations.

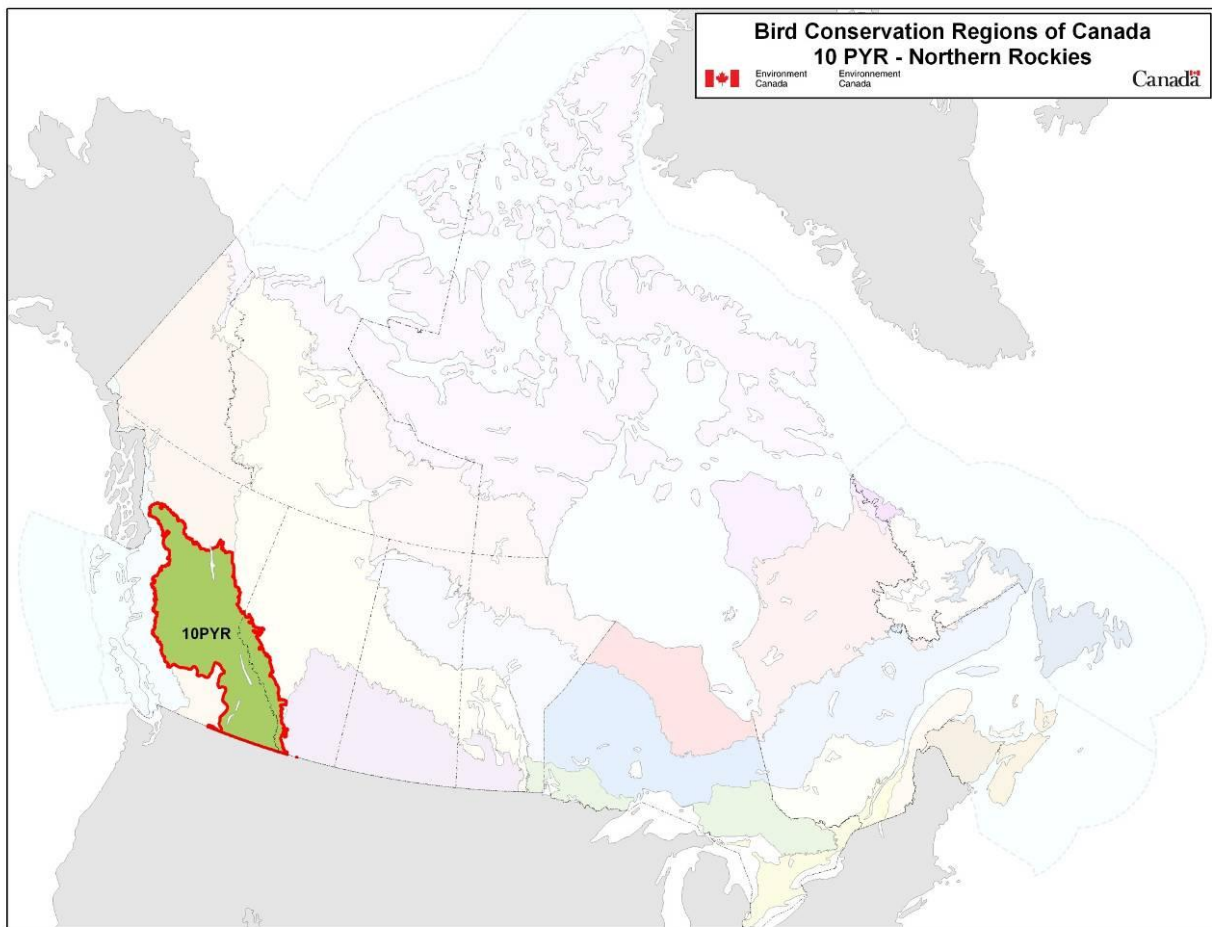
Environment Canada has developed national standards for strategies to ensure consistency of approach across BCRs. Bird Conservation Strategies will provide the context from which specific implementation plans can be developed for each BCR, building on the programs currently in place through Joint Ventures or other partnerships. Landowners including Aboriginal peoples will be consulted prior to implementation.

Conservation objectives and recommended actions from the conservation strategies will be used as the biological basis to develop guidelines and beneficial management practices that support compliance with regulations under the *Migratory Birds Convention Act, 1994*.

## **Acknowledgements**

Ivy Whitehorne, Alaine Camfield, Veronique Connolly, Alicia Newbury, Holly Middleton and Elsie Krebs were the main authors of this document that follows templates developed by Alaine Camfield, Judith Kennedy and Elsie Krebs with the help of the BCR planners in each of the Canadian Wildlife Service regions throughout Canada. However, work of this scope cannot be accomplished without the contribution of other colleagues who provided or validated technical information, commented on earlier draft versions of the strategy, and supported the planning process. We would like to thank the following people: Andre Breault, Fred Bunnell, Rob Butler, Dick Cannings, Myke Chutter, Krista De Groot, Orville Dyer, Wendy Easton, Kevin Fort, Les Gyug, Andrew Harcombe, Bruce Harrison, Tanya Luszcz, Ian Mackenzie, Nancy Mahony, Kathleen Moore, Sampath Seneviratne and Dominique Sigg.

## Bird Conservation Strategy for Bird Conservation Region 10 Pacific and Yukon Region: Northern Rockies



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## Executive Summary

The Canadian portion of Bird Conservation Region (BCR) 10 is about 44 million ha in extent. It covers the Columbia and Rocky Mountains from the Canada-US border in the south to the southern edge of the boreal forest in the north, and extends westward over the central plateau in interior British Columbia to the Coast Mountains. BCR 10 is one of the most ecologically diverse regions in Canada, as extremes and contrasts in topography and climate combine to create a tremendous variety of habitat types in close proximity, including lakes and ponds, wetlands, riparian areas, grasslands, shrub-steppe, dry and moist coniferous forests, and alpine tundra. Coniferous forests are the dominant land cover; alpine areas are the second most common habitat type.

This conservation strategy for BCR 10 in the Pacific and Yukon Region (PYR) builds on existing bird conservation strategies and complements those created for the other BCRs across Canada. BCR strategies will serve as a framework for implementing bird conservation nationally, and also identify international conservation issues for Canada's priority birds. This strategy is not intended to be highly prescriptive, but rather is intended to guide future implementation efforts undertaken by various partners and stakeholders.

The diversity of habitats found in the BCR results in an equally diverse bird fauna, as there are 230 species that regularly breed, overwinter, and/or reside year-round within the region. Of these, 77 species were identified as priority species. The priority species list in this BCR is dominated by landbirds (65% of the total list) but also includes waterbirds (14%), waterfowl (16%) and shorebirds (5%). However, approximately half of all waterbirds, waterfowl, and shorebirds occurring in the BCR were identified as priority species (55%, 50% and 44%, respectively), compared to only 28% of landbirds. Forty-two per cent (42%) of the priority species are considered at risk, either federally or provincially.

Identifying the broad habitat requirements for each priority species within the BCR allowed species to be grouped by shared habitat-based conservation issues and actions. In BCR 10, a maximum of two broad-scale habitat associations were identified for each priority species. Coniferous forest habitats are used by the greatest number of priority species (28 species), reflecting the prevalence of this habitat type on the landscape in BCR 10. Wetlands are also an important habitat type in the BCR, and are used by 20 priority species. Herbaceous habitats (including native grasslands, shrubsteppe and agricultural habitats) are associated with 16 priority species, and waterbodies are also widely used (18 priority species).

The population objectives in this strategy are categorical and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain." Forty-eight percent (48%) of priority species, with representatives from all bird groups, were assigned an objective to "assess" population status while "maintaining" current levels in the interim. For 18% of priority species, population levels were deemed to be at or near the objective. Seventeen percent (17%) and 13% of priority species were assigned objectives to increase the population by 50% and to

double the population, respectively. For a small proportion of species (4%), all SARA-listed, we have deferred to the population objectives developed in Recovery Strategies.

An assessment of threats identified a number of conservation issues facing priority species in the various habitats of PYR's BCR 10. Loss and degradation of forest habitats (coniferous, mixed and riparian habitat classes) through logging and forest harvesting were identified as the most severe threats to priority bird species in this BCR. Impacted priority species are many, but include Northern Saw-whet Owl, Barrow's Goldeneye and Golden-crowned Kinglet. Another major threat in this BCR is natural systems modification, which is driven to a large extent by massive changes in forest structure due to the mountain pine beetle outbreak or fire suppression activities (affecting, for example, Dusky Flycatcher, Cassin's Vireo), but also includes changes to wetlands and waterbodies arising from water management practices (affecting Western Grebe, Harlequin Duck). Threats from agricultural practices were also significant, stemming from loss or degradation of habitat due to agricultural conversion or intensification (affecting Horned Lark, Short-eared Owl) or degradation due to overgrazing (affecting Sharp-tailed Grouse, Northern Harrier). Impacts associated with climate change presented significant threats to many priority species through, for example, habitat loss or degradation (e.g., Brewer's Sparrow *taverneri*, American Bittern) and temporal mismatches in peak food availability (e.g., Common Nighthawk, Rufous Hummingbird).

Conservation objectives were designed to address threats and information gaps that were identified for priority species. They describe the environmental conditions, and research and monitoring, that are thought to be necessary for progress towards population objectives and to understand underlying conservation issues for priority bird species. The majority of conservation objectives for BCR 10 relate to maintaining or enhancing habitat quality and quantity. Included in these objectives are: the maintenance of the full range of naturally occurring habitat types, maintaining the quality of existing habitats, and retaining important features on the landscape (e.g., standing dead snags for cavity nesting birds). Also important is the need to reduce mortality of priority species (which includes reducing collisions with human-made structures, destruction of nests, pesticide poisoning and mortality caused by ingestion of lead shot) and managing impacts of climate change on habitat availability and suitability. Other objectives relate to reducing human disturbance of breeding birds, ensuring pesticide use does not deplete food supplies for insectivorous birds, and targeted management of some individual priority bird species.

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives. Actions are strategic rather than highly detailed and prescriptive, and are not prioritized. Whenever possible, recommended actions benefit multiple species, and/or respond to more than one threat. Actions relating to the development of beneficial management practices or other voluntary private sector codes of practice comprise nearly 50% of the total recommended actions. This is due in part to the fact that the development of voluntary beneficial practices are recommended to address both the need for land/water protection and management. For example, a forestry company may develop, for its area of operation, beneficial management practices (BMP) that result in the maintenance of a mosaic



of habitat types, seral stages and specific important habitat features to priority bird species. As another example, ranchers may use a BMP to manage grazing in such a way as to maintain the composition, density and vigour of natural undergrowth, as well as to minimize soil compaction.

## Introduction: Bird Conservation Strategies

### **Context**

This document is one of a suite of Bird Conservation Region Strategies (BCR strategies) that have been drafted by Environment Canada for all regions of Canada. These strategies respond to Environment Canada's need for integrated and clearly articulated bird conservation needs to support the implementation of Canada's migratory birds program, both domestically and internationally. This suite of strategies builds on existing conservation plans for the four bird "bird groups" (waterfowl,<sup>1</sup> waterbirds,<sup>2</sup> shorebirds,<sup>3</sup> and landbirds<sup>4</sup>) in most regions of Canada, as well as on national and continental plans, and includes birds under provincial/territorial jurisdiction. These new strategies also establish standard conservation planning methods across Canada, and fill gaps, as previous regional plans do not cover all areas of Canada or all bird groups.

These strategies present a compendium of required actions based on the general philosophy of achieving scientifically-based desired population levels as promoted by the four pillar initiatives of bird conservation. Desired population levels are not necessarily the same as minimum viable or sustainable populations, but represent the state of the habitat/landscape at a time prior to recent dramatic population declines in many species from threats known and unknown. The threats identified in these strategies were compiled using currently available scientific information and expert opinion. The corresponding conservation objectives and actions will contribute to stabilizing populations at desired levels.

The BCR strategies are not highly prescriptive. In most cases, practitioners will need to consult additional information sources at local scales to provide sufficient detail to implement the recommendations of the strategies. Tools such as beneficial management practices will also be helpful in guiding implementation. Partners interested in participating in the implementation of these strategies, such as those involved in the habitat Joint Ventures established under the North American Waterfowl Management Plan (NAWMP), are familiar with the type of detailed implementation planning required to coordinate and undertake on-the-ground activities.

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<sup>1</sup> NAWMP Plan Committee 2004

<sup>2</sup> Milko et al. 2003

<sup>3</sup> Donaldson et al. 2000

<sup>4</sup> Rich et al. 2004

## ***Strategy Structure***

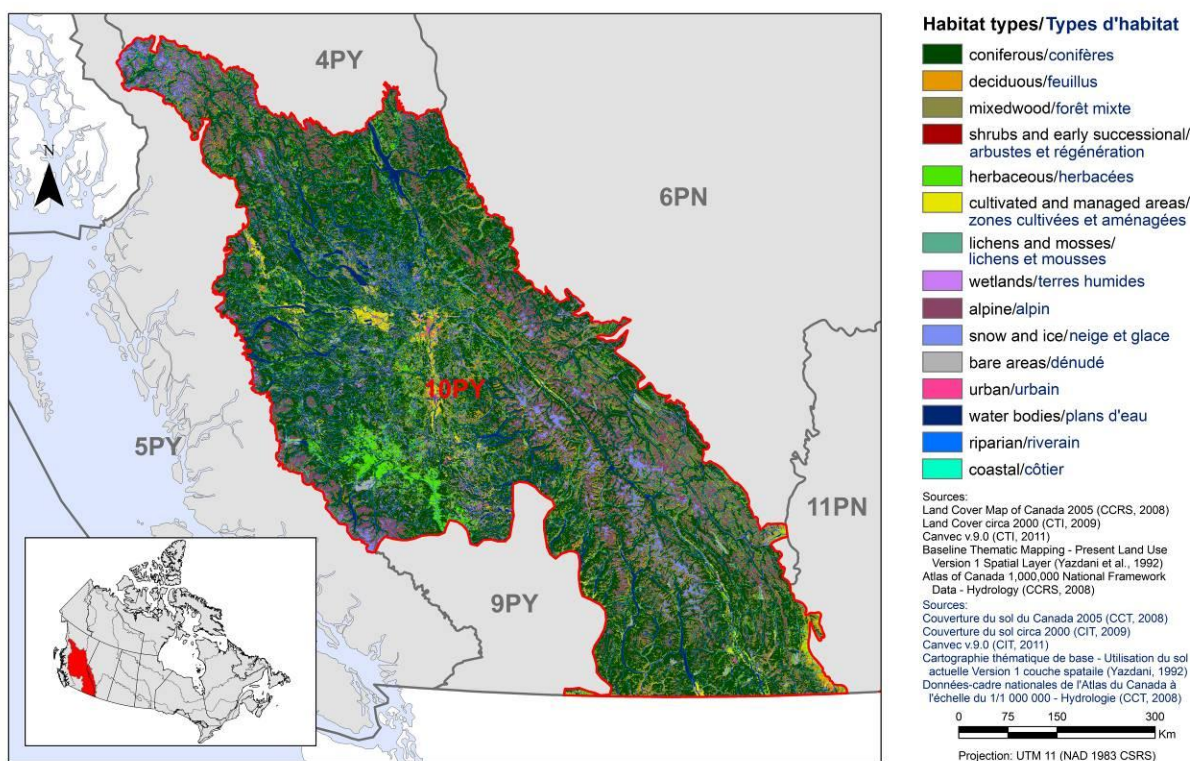
**Section 1:** Summary of Results – All Birds, All Habitats of this strategy presents general information about the BCR and the subregion, with an overview of the six elements<sup>5</sup> that provide a summary of the state of bird conservation at the sub-regional level. **Section 2:** Conservation Needs by Habitat provides more detail on the threats, objectives and actions for priority species grouped by each of the broad habitat types in the subregion. **Section 3:** Additional Issues presents additional widespread conservation issues that are not specific to a particular habitat or were not captured by the threat assessment for individual species, as well as research and monitoring needs, and threats to migratory birds while they are outside of Canada. The approach and methodology are summarized in the appendices, but details are available in a separate document (Kennedy et al. 2012). A national database houses all the underlying information summarized in this strategy and is available from [Environment Canada](#).

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<sup>5</sup> The six elements are: Element 1– priority species assessment; Element 2 – habitats important to priority species; Element 3 – population objectives; Element 4 – threat assessment; Element 5 – conservation objectives; Element 6 – recommended actions.

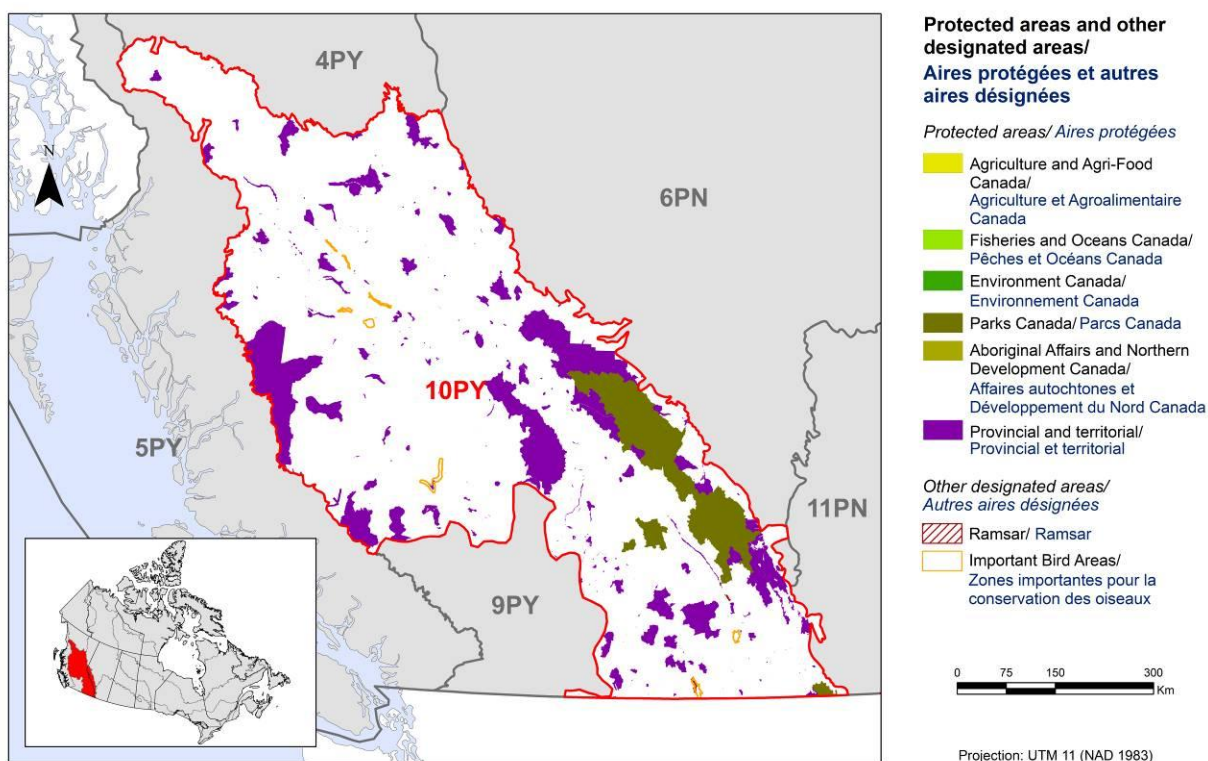
### **Characteristics of Bird Conservation Region 10: Northern Rockies**

The Canadian portion of BCR 10 is about 44 million hectares in extent, and covers the Columbia and Rocky Mountains from the Canada-US border in the south to the southern edge of the boreal forest in the north, and extends westward over the central plateau in interior British Columbia to the Coast Mountains (Fig. 1). BCR 10 is one of the most ecologically diverse regions in Canada (Ecological Stratification Working Group 1995), as extremes and contrasts in topography and climate combine to create a tremendous variety of habitat types in close proximity, including lakes and ponds, wetlands, riparian areas, grasslands, shrub-steppe, dry and moist coniferous forests, and alpine tundra (CIJV Technical Committee 2010). Coniferous forests are the dominant land cover (56% of the BCR); alpine areas are the second most common habitat type (10%; CIJV 2009). There is a diversity of habitats in the BCR and a high number of bird species, with 230 species that regularly breed, overwinter, and/or reside year-round within the region.



**Figure 1. Landcover in BCR 10 Pacific and Yukon Region: Northern Rockies.**

BCR 10 has a relatively small population, with approximately 400,000 people living in the BCR in 2006 (Harding 2009). Prince George (pop. 83,000) is the largest urban centre (Statistics Canada 2008). A relatively high percentage of the BCR (about 19%, over 8.3 million ha) is protected within national and provincial parks and other protected areas (CIJV Technical Committee 2010; Fig. 2).



**Figure 2. Map of protected and designated areas in BCR 10 Pacific and Yukon Region: Northern Rockies.**

Despite its small population size and remote and rugged terrain, much of BCR 10 is a managed, working landscape. Resource-based industries such as agriculture, ranching, forestry and mining, as well as tourism and recreation, are the key economic activities in the region (CIJV Technical Committee 2010). The threats to priority bird species identified within BCR 10 reflect these activities. For example, native grasslands have been almost completely converted to agriculture, and forest structure has been heavily altered through extensive timber harvest. The current outbreak of mountain pine beetle in British Columbia, which spans all of BCR 10 and is unprecedented in scope, poses risks for many priority species using forest habitats. Climate change is also expected to have broad impacts across the BCR, particularly in alpine and wetland habitats (Pojar 2010, CIJV Technical Committee 2010).

## Section 1: Summary of Results – All Birds, All Habitats

### ***Element 1: Priority Species Assessment***

These Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each BCR subregion (see [Appendix 1](#)). Species that are vulnerable due to population size, distribution, population trend, abundance and threats are included because of their “conservation concern.” Some widely distributed and abundant “stewardship” species are also included. Stewardship species are included because they typify the national or regional avifauna and/or because they have a large proportion of their range and/or continental population in the subregion; many of these species have some conservation concern, while others may not require specific conservation effort at this time. Species of management concern are also included as priority species when they are at (or above) their desired population objectives but require ongoing management because of their socio-economic importance as game species or because of their impacts on other species or habitats (see [Appendix 2](#)).

The purpose of the prioritization exercise is to focus implementation efforts on the issues of greatest significance for Canadian avifauna. Table 1 provides a full list of all priority species and their reason for inclusion. Tables 2 and 3 summarize the number of priority species in BCR 10 Pacific and Yukon Region by bird group and by the reason for priority status.

In BCR 10, the priority species list is dominated by landbirds (50 species) but also includes waterbirds (11 species), waterfowl (12 species) and shorebirds (4 species). However, approximately half of all waterbirds, waterfowl, and shorebirds occurring in the BCR were identified as priority species (55%, 50% and 44%, respectively), compared to only 28% of landbirds. Forty-two percent (42%) of the priority species are considered at risk, either federally or provincially.

In BCR 10, the Canada Goose was identified as a priority species. Historically, Canada Goose populations in southern BC were characterized by very low densities and a scattered distribution, but through transplant programs and natural dispersal, this species has expanded its distribution and abundance significantly over the last three decades. In this plan, population objectives, identified threats and recommended actions related to the Canada Goose refer solely to migratory populations, and do not refer to resident populations that both breed and winter in urban areas. These resident populations are responsible for a high incidence of conflicts with humans, and urban authorities (such as municipal governments) may elect to set population objectives for Canada geese and manage toward that goal through habitat modification and control measures.

**Table 1. Priority species in BCR 10 Pacific and Yukon Region, population objective, and the reason for priority status.**

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
American Dipper	Landbird	3		Assess / Maintain								Y			
Barn Swallow	Landbird	5		Increase 100%	T		Blue								
Black Swift	Landbird	4		Increase 50%					Y	Y					
Bobolink	Landbird	3		Assess /	T		Blue								

<sup>1</sup> PIF: Partners in Flight. PT 5 = < -50% total population change, 4 = -50% to -15%, 3 = -15% to 0%, 2 = 0% to +50%, and 1 = > +50% (Rocky Mountain Bird Observatory 2005)

<sup>2</sup> CSCP: Canadian Shorebird Conservation Plan (Donaldson et al. 2000). Population trends 5 = significant population decline, 3 = apparently stable population or status unknown, 1 = significant population increase

<sup>3</sup> WOW: Wings Over Water (Milko et al. 2003). Population trends 5 = biologically significant population decline, 3 = apparently stable population, 1 = biologically significant population increase

<sup>4</sup> Population objectives were modified based on expert review so may not correspond directly with the PT score. In addition, waterfowl objectives were taken from the Canadian Intermountain Joint Venture's Biological Foundation and Prospectus (CIJV 2003) and Implementation Plan (CIJV Technical Committee 2010).

<sup>5</sup> Assessed by COSEWIC ([Committee on the Status of Endangered Wildlife in Canada](#)) as: E, Endangered; T, Threatened; SC, Special Concern

<sup>6</sup> Species listed on [Schedule 1 of the Species at Risk Act](#) as E, Endangered; T, Threatened; SC, Special Concern (Species at Risk Public Registry 2012)

<sup>7</sup> Red: Red Listed, Blue: Blue Listed by the [British Columbia Conservation Data Centre](#)

<sup>8</sup> Listed by the [province of Alberta](#) as: E, Endangered; T, Threatened; SC, Special Concern

<sup>9</sup> NAWMP: North American Waterfowl Management Plan (North American Waterfowl Management Plan, Plan Committee, 2004)

Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
				Maintain											
Brewer's Sparrow ( <i>taverneri</i> )	Landbird	3		Assess / Maintain					Y	Y					
Calliope Hummingbird	Landbird	3		Assess / Maintain					Y		Y	Y			
Canyon Wren	Landbird	3		Assess / Maintain			Blue								
Cassin's Finch	Landbird	5		Increase 100%						Y	Y	Y			
Cassin's Vireo	Landbird	3		Assess / Maintain								Y			
Clark's Nutcracker	Landbird	3		Assess / Maintain							Y	Y			
Common Nighthawk	Landbird	5		Increase 100%	T	T									
Dusky Flycatcher	Landbird	4		Increase 50%							Y	Y			
Dusky Grouse	Landbird	3		Assess / Maintain					Y	Y					
Evening Grosbeak	Landbird	5		Increase 100%						Y					
Ferruginous Hawk	Landbird	3		Assess / Maintain	T	T		E		Y					
Flammulated Owl	Landbird	3		Increase 50%	SC	SC	Blue		Y						
Golden-crowned	Landbird	3		Assess /								Y			



Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
Kinglet				Maintain											
Hammond's Flycatcher	Landbird	3		Assess / Maintain								Y			
Horned Lark	Landbird	4		Increase 50%											
Lark Sparrow	Landbird	3		Assess / Maintain			Red								
Lazuli Bunting	Landbird	2		Maintain current								Y			
Lewis's Woodpecker	Landbird	4		Increase 50%	T	T	Red		Y	Y					
Northern Goshawk	Landbird	4		Increase 50%						Y		Y			
Northern Harrier	Landbird	4		Increase 50%						Y					
Northern Pygmy-Owl	Landbird	3		Assess / Maintain								Y			
Northern Saw-whet Owl	Landbird	3		Assess / Maintain								Y			
Olive-sided Flycatcher	Landbird	5		Increase 100%	T	T	Blue		Y	Y					
Peregrine Falcon ( <i>anatum</i> )	Landbird	3		Increase 50%	SC	SC	Red	T							
Pine Siskin	Landbird	5		Increase 100%						Y		Y			
Prairie Falcon	Landbird	3		Assess /			Red	SC							

Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
				Maintain											
Pygmy Nuthatch	Landbird	3		Assess / Maintain						Y					
Red Crossbill	Landbird	3		Assess / Maintain						Y		Y			
Red-naped Sapsucker	Landbird	3		Assess / Maintain							Y	Y			
Ruffed Grouse	Landbird	3		Assess / Maintain								Y			
Rufous Hummingbird	Landbird	3		Assess / Maintain					Y		Y	Y			
Rusty Blackbird	Landbird	3		Increase 100%	SC	SC	Blue		Y						
Sharp-tailed Grouse	Landbird	3		Increase 50%			Blue			Y					
Short-eared Owl	Landbird	3		Increase 50%	SC	SC	Blue		Y						
Swainson's Hawk	Landbird	5		Increase 100%			Red		Y	Y					
Swainson's Thrush	Landbird	4		Increase 50%						Y		Y			
Townsend's Solitaire	Landbird	3		Assess / Maintain								Y			
Townsend's Warbler	Landbird	3		Assess / Maintain								Y			
Western Screech-	Landbird	3		Recovery	E	E	Red								

Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
Owl ( <i>macfarlanei</i> )				objective											
Western Tanager	Landbird	3		Assess / Maintain								Y			
White-tailed Ptarmigan	Landbird	3		Assess / Maintain								Y			
White-throated Swift	Landbird	3		Assess / Maintain					Y						
Williamson's Sapsucker	Landbird	3		Recovery objective	E	E	Red			Y	Y	Y			
Willow Flycatcher	Landbird	3		Assess / Maintain					Y			Y			
Yellow Warbler	Landbird	5		Increase 100%						Y					
Yellow-breasted Chat	Landbird	3		Recovery objective	E	E	Red								
American Avocet	Shorebird	3	3	Assess / Maintain			Red								
Long-billed Curlew	Shorebird	3	5	Maintain current	SC	SC	Blue	SC	Y						
Upland Sandpiper	Shorebird	3	2	Assess / Maintain			Red								
Wilson's Phalarope	Shorebird	3	4	Assess / Maintain					Y						

Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
American Bittern	Waterbird	5	4	Increase 100%			Blue								
American White Pelican	Waterbird	3	3	Assess / Maintain			Red					Y			
Black Tern	Waterbird	3	5	Assess / Maintain					Y			Y			
California Gull	Waterbird	3	3	Assess / Maintain			Blue					Y			
Common Loon	Waterbird	3	3	Assess / Maintain								Y			
Double-crested Cormorant	Waterbird	3	1	Assess / Maintain			Blue								
Forster's Tern	Waterbird	3	4	Assess / Maintain			Red								
Great Blue Heron	Waterbird	3	1	Assess / Maintain			Blue								
Horned Grebe	Waterbird	3	4	Increase 50%	SC	SC									
Western Grebe	Waterbird	3	3	Increase 50%			Red	SC				Y			
American Wigeon	Waterfowl	3		Maintain current									Y	Mod High	
Barrow's Goldeneye	Waterfowl	3		Maintain current									Y	High	
Bufflehead	Waterfowl	3		Maintain current									Y	High	
Canada Goose	Waterfowl	2		Maintain current									Y	High	

Table 1 continued

Priority species	Bird group	Population trend score (PIF <sup>1</sup> )	Population trend score (CSCP <sup>2</sup> , WOW <sup>3</sup> )	Population objective <sup>4</sup>	COSEWIC <sup>5</sup>	SARA <sup>6</sup>	British Columbia provincial listing <sup>7</sup>	Alberta provincial listing <sup>8</sup>	National/continental concern (landbirds, waterbirds, shorebirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP <sup>9</sup> priority (waterfowl only)	NAWMP rank (waterfowl only)	Expert review (changes to priority list)
Cinnamon Teal	Waterfowl	3		Maintain current									Y	Mod High	
Harlequin Duck	Waterfowl	3		Maintain current				SC					Y	Mod High	
Hooded Merganser	Waterfowl	3		Maintain current										Moderate	Added
Lesser Scaup	Waterfowl	1		Maintain current									Y	Mod High	
Mallard	Waterfowl	3		Maintain current									Y	High	
Ring-necked Duck	Waterfowl	3		Maintain current									Y	Mod High	
Trumpeter Swan	Waterfowl	3		Maintain current				T						Moderate	
White-winged Scoter	Waterfowl	3		Maintain current									Y	Mod High	

**Table 2. Summary of priority species, by bird group, in BCR 10 Pacific and Yukon Region.**

Bird Group	Total Species	Total Priority Species	Percent Listed as Priority	Percent of Priority List
Landbird	177	50	28%	65%
Shorebird	9	4	44%	5%
Waterbird	20	10	50%	13%
Waterfowl	24	12	50%	16%
<b>Total</b>	<b>230</b>	<b>76</b>		<b>100%</b>

**Table 3. Number of priority species in BCR 10 Pacific and Yukon by reason for priority status.**

Reason for Priority Listing <sup>1</sup>	Landbirds	Shorebirds	Waterbirds	Waterfowl
COSEWIC <sup>2</sup>	13	1	1	-
Listed under the Federal SARA <sup>3</sup>	11	1	1	-
Provincially Listed <sup>4</sup>	17	3	7	2
NAWMP <sup>5</sup>	-	-	-	10
National/Continental Concern	13	2	1	-
Regional Concern	18	-	-	-
National/Continental Stewardship	7	-	-	-
Regional Stewardship	24	-	5	-

<sup>1</sup> A single species can be on the priority list for more than one reason. Note that not all reasons for inclusion apply to every bird group (indicated by "-").

<sup>2</sup> COSEWIC indicates species assessed by COSEWIC as Endangered, Threatened, or Special Concern.

<sup>3</sup> Species listed on Schedule 1 of the *Species at Risk Act* as Endangered, Threatened, or Special Concern.

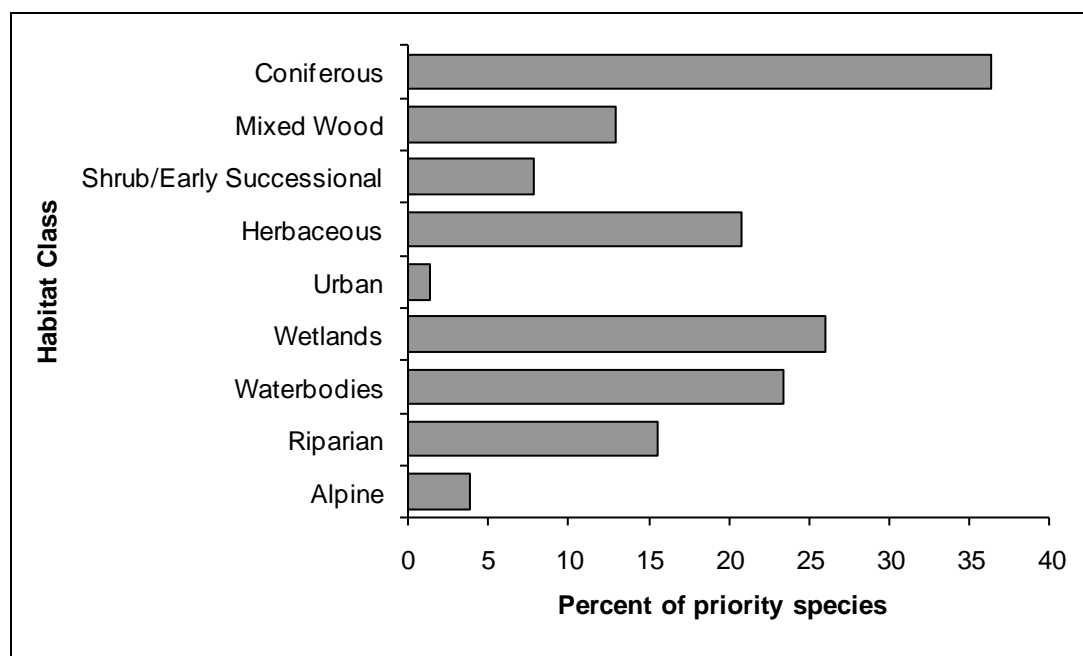
<sup>4</sup> *Provincially Listed* indicates species assessed by the province of Alberta as Endangered, Threatened, or Special Concern, or Red-listed or Blue-listed by British Columbia's Conservation Data Centre.

<sup>5</sup> NAWMP indicates species ranked in the North American Waterfowl Management Plan (Plan Committee 2004) as having Highest, High or Moderately High breeding or non-breeding conservation and/or monitoring need in the BCR.

## ***Element 2: Habitats Important to Priority Species***

Identifying the broad habitat requirements for each priority species within the BCR allowed species to be grouped by shared habitat-based conservation issues and actions (see [Element 2: Habitats Important to Priority Species](#) for details on how species were assigned to standard habitat categories). If many priority species associated with the same habitat face similar conservation issues, then conservation action in that habitat may support populations of several priority species. BCR strategies use a modified version of the standard land cover classes developed by the United Nations (Food and Agriculture Organization 2000) to categorize habitats and species were often assigned to more than one habitat class.

In BCR 10, a maximum of two habitat associations were identified for each priority species. Coniferous forest habitats are used by the greatest number of priority species (28), reflecting the prevalence of this habitat type on the landscape in BCR 10. Wetlands are also an important habitat type in the BCR, and are used by 20 priority species. Herbaceous habitats (16 priority species) and waterbodies (18 priority species) are also widely used (Fig. 3).



**Figure 3. Percent of priority species that are associated with each habitat type in BCR 10 Pacific and Yukon Region.**

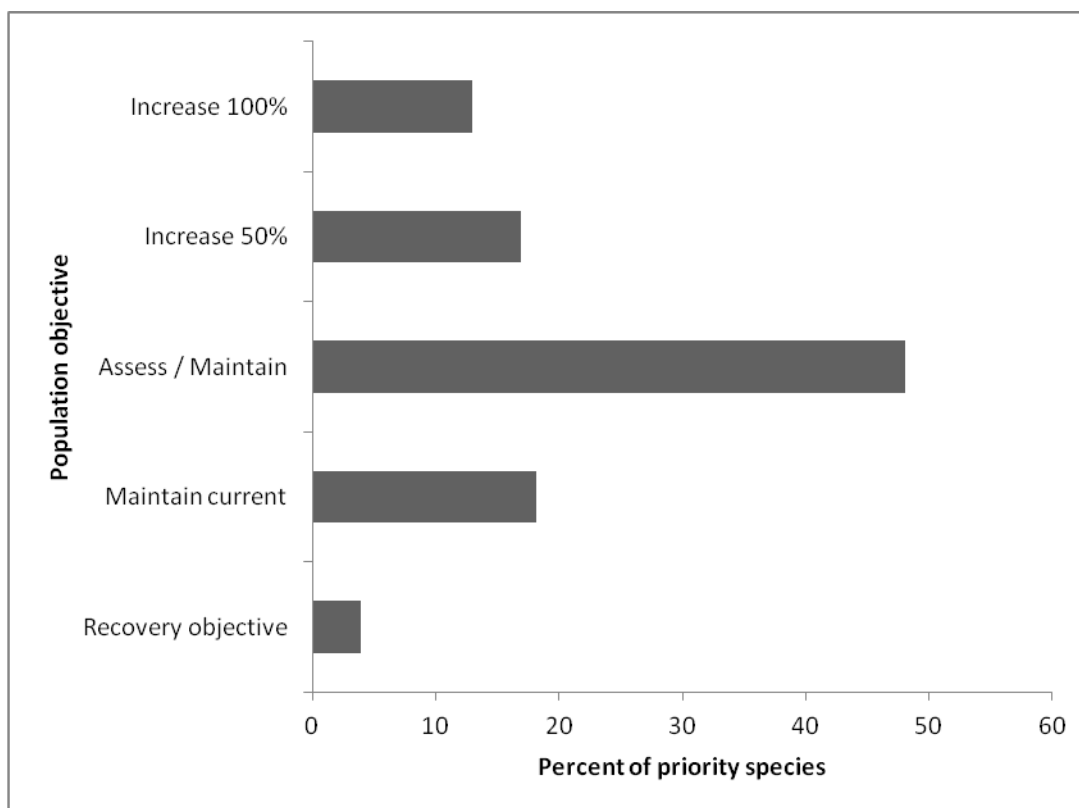
**Note:** The total exceeds 100% because each species may be assigned to more than one habitat.

### ***Element 3: Population Objectives***

Population objectives allow us to measure and evaluate conservation success. The objectives in this strategy are assigned to categories and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain," and a monitoring objective is given (see [Element 3: Population Objectives for Priority Species](#)). For any species listed under the *Species at Risk Act* (SARA) or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. The ultimate measure of conservation success will be the extent to which population objectives have been reached over the next 40 years. Population objectives do not currently factor in feasibility of achievement, but are held as a standard against which to measure progress.

The population objectives in this strategy are categorical and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain." Forty-eight percent (48%) of priority species, with representatives from all bird groups, were assigned an objective to "assess" population status while "maintaining" current levels in the interim (Fig. 4). For 18% of species, population levels were deemed to be at or near the objective. Seventeen percent and 13% of species were assigned objectives to increase the population by 50% and to double the population, respectively. For a small proportion of species (4%), all SARA-listed, we have deferred to the population objectives developed in Recovery Strategies.





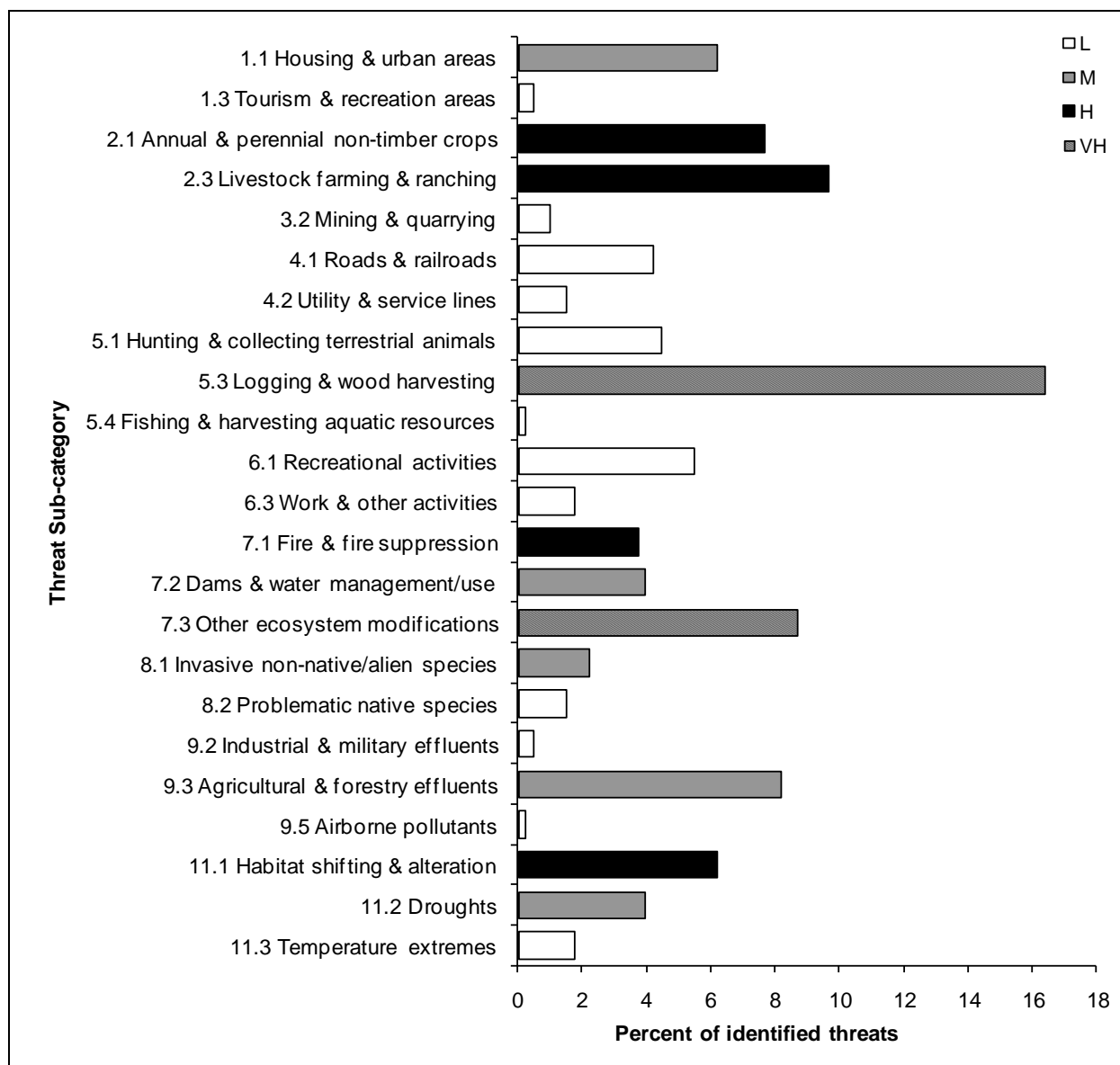
**Figure 4. Percent of priority species that are associated with each population objective category in BCR 10 Pacific and Yukon Region.**

#### ***Element 4: Threat Assessment for Priority Species***

The threats assessment process (see [Element 4: Threat Assessment for Priority Species](#)) identifies threats believed to have a population-level effect on individual priority species. These threats are assigned a relative magnitude (Low, Medium, High, Very High), based on their scope (the proportion of the species' range within the subregion that is impacted) and severity (the relative impact on the priority species' population). This allows us to target conservation actions towards threats with the greatest effects on suites of species or in broad habitat classes. Some well known conservation issues (such as predation by domestic cats or climate change) may not be identified in the literature as significant threats to populations of an individual priority species and therefore may not be captured in the threat assessment. However, they merit attention in conservation strategies because of the large numbers of individual birds affected in many regions of Canada. We have incorporated them in a separate section on [Widespread Issues](#) but, unlike other threats, they are not ranked.

An assessment of threats identified a number of conservation issues facing priority species in the various habitats of PYR's BCR 10. Loss and degradation of forest habitats (coniferous, mixed and riparian habitat classes) through logging and forest harvesting was identified as the most severe threat to priority bird species in this BCR (Fig. 5 and Table 4). Impacted species are many, but include among the priority species Northern Saw-whet Owl, Barrow's Goldeneye, and

Golden-crowned Kinglet. Another major threat in this BCR is natural systems modification, which is driven to a large extent by massive changes in forest structure due to the mountain pine beetle outbreak or fire suppression activities (affecting, for example, Dusky Flycatcher, Cassin's Vireo), but also includes changes to wetlands and waterbodies arising from water management practices (affecting Western Grebe, Harlequin Duck). Threats from agricultural practices were also significant, stemming from loss or degradation of habitat due to agricultural conversion or intensification (affecting Horned Lark, Short-eared Owl) or degradation due to overgrazing (affecting Sharp-tailed Grouse, Northern Harrier). Impacts associated with climate change presented significant threats to many species through, for example, habitat loss or degradation (e.g., Brewer's Sparrow *taverneri*, American Bittern) and temporal mismatches in peak food availability (e.g., Common Nighthawk, Rufous Hummingbird).



**Figure 5. Percent of identified threats to priority species within BCR 10 Pacific and Yukon Region by threat sub-category.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in BCR 10 (for example, if 100 threats were identified in total for all priority species in BCR10, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). Shading in the bars (VH = very high, H = high, M = medium and L = low) represents the rolled up magnitude of all threats in each threat subcategory in the BCR. (See [Element 4: Threat Assessment for Priority Species](#) for details on how magnitude was assessed). *5.1 Hunting and collecting terrestrial animals* refers primarily to lead poisoning of waterfowl from consumption of lead shot. Threats under *6.1 Recreation activities* and *6.3 Work & other activities* refer to the impacts of human disturbance from these activities. Threats under *7.3 Other ecosystem modifications* are primarily changes in forest structure due to the Mountain Pine Beetle outbreak. *8.2 Problematic native species* refers primarily to Brown-headed Cowbird parasitism. *9.3 Agricultural and forestry effluents* refers primarily to effects of pesticide use. See [Section 2: Conservation Needs by Habitat](#) for a more detailed breakdown for each habitat class.

**Table 4. Relative magnitude of identified threats to priority species within BCR 10 Pacific and Yukon Region by threat category and broad habitat class.**

Overall ranks were generated through a roll-up procedure described in Kennedy et al. (2012). L represents Low Magnitude threats; M = Medium; H = High; VH = Very High. Blank cells indicate that no priority species had threats identified in the threat category/habitat combination.

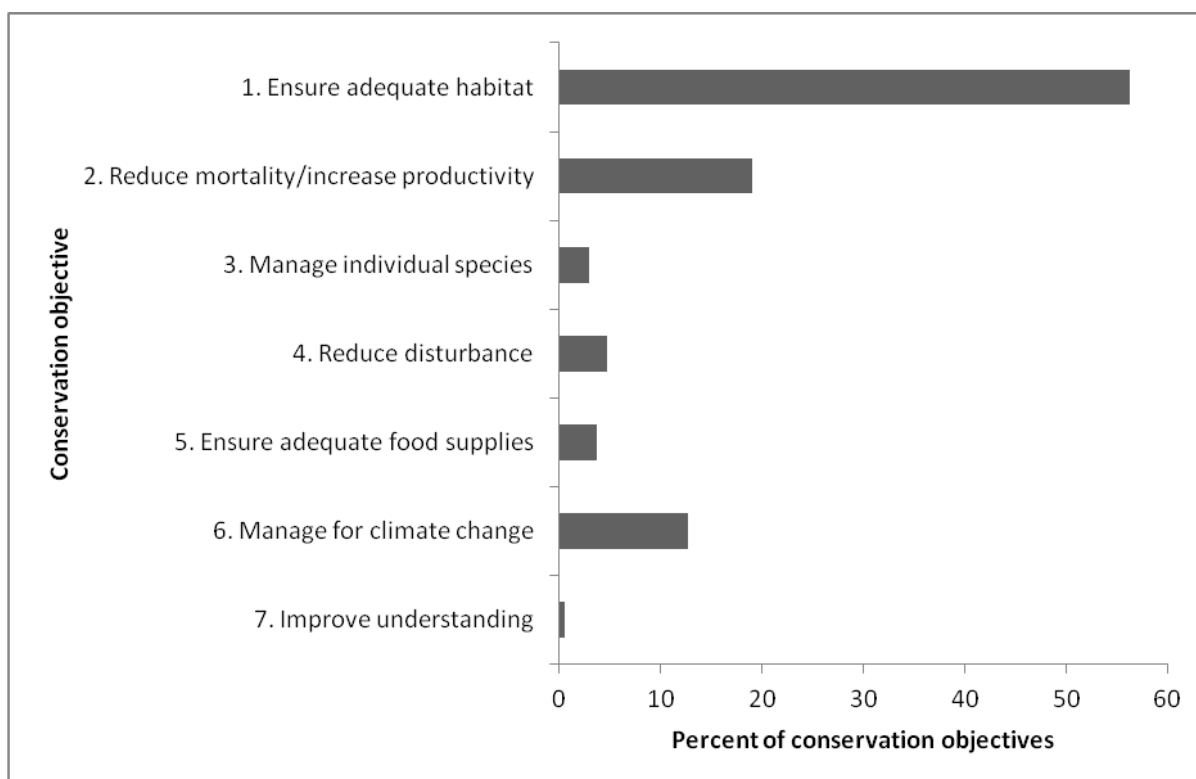
Threat category	Habitat class									
	Coniferous	Mixed	Shrub/Early Successional	Herbaceous	Urban	Wetlands	Waterbodies	Riparian	Alpine	Overall
<b>Overall</b>	<b>VH</b>	<b>VH</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>M</b>	
1 Residential & commercial development	L	L		L	L	M	L	H	L	<b>M</b>
2 Agriculture & aquaculture	M	L		VH		H	M	H		<b>H</b>
3 Energy production & mining	L					L	L			<b>L</b>
4 Transportation & service corridors	L	L	L	L		L	L	L		<b>L</b>
5 Biological resource use	VH	VH		L	L	L	M	H		<b>VH</b>
6 Human intrusions & disturbance	L	L	L	L		L	M	L		<b>L</b>
7 Natural system modifications	VH	VH	H	H	L	M	H	M		<b>VH</b>
8 Invasive & other problematic species & genes	M			M		L	L	M		<b>M</b>
9 Pollution	M	L	L	H	M	M	H	L		<b>H</b>
11 Climate change & severe weather	H	L	M	M	L	H	M	H	H	<b>H</b>

Threats to priority species while they are outside Canada during the non-breeding season were also assessed and are presented in [Threats Outside Canada](#).

### ***Element 5: Conservation Objectives***

Conservation objectives were designed to address threats and information gaps that were identified for priority species. They describe the environmental conditions and research and monitoring that are thought to be necessary for progress towards population objectives and to understand underlying conservation issues for priority bird species. As conservation objectives are reached they will collectively contribute to achieving population objectives. Whenever possible, conservation objectives were developed to benefit multiple species, and/or respond to more than one threat (see [Element 5: Conservation Objectives](#)).

The majority of conservation objectives for BCR 10 relate to maintaining or enhancing habitat quality and quantity (Fig. 6). Included in these objectives are the maintenance of the full range of naturally-occurring habitat types, maintaining the quality of existing habitats, and retaining important features on the landscape (e.g., standing dead snags for cavity nesting birds). Also important is the need to reduce mortality of priority species (which includes reducing collisions with man-made structures, destruction of nests, pesticide poisoning, and mortality caused by ingestion of lead shot) and managing impacts of climate change on habitat availability and suitability. Other objectives relate to reducing human disturbance of breeding birds, ensuring pesticide use does not deplete food supplies for insectivorous birds, and targeted management of some individual priority species.

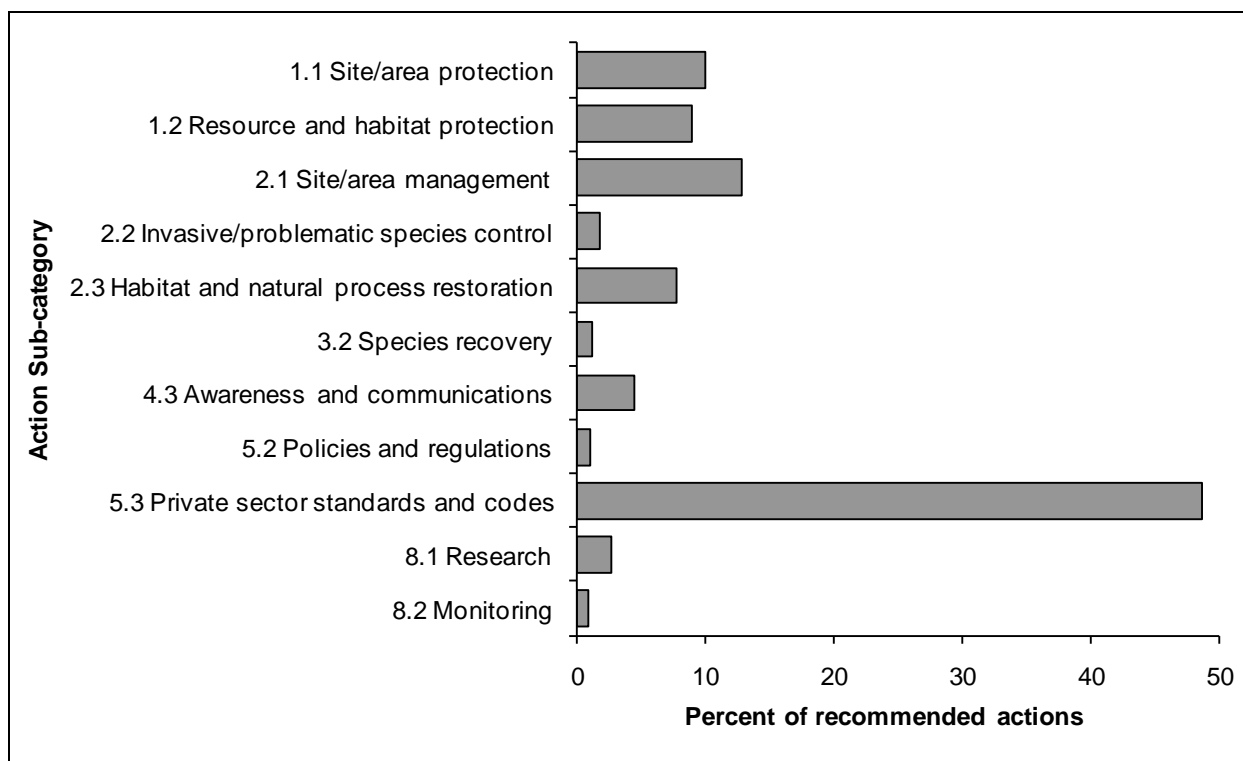


**Figure 6. Percent of all conservation objectives assigned to each conservation objective category in BCR 10 Pacific and Yukon Region.**

***Element 6: Recommended Actions***

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (Fig. 7). Actions are strategic rather than highly detailed and prescriptive (see [Element 6: Recommended Actions](#)). Whenever possible, recommended actions benefit multiple species, and/or respond to more than one threat. Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but will usually be more general than those developed for individual species.

Actions relating to the development of beneficial management practices (BMPs) or other voluntary private sector codes of practice comprise nearly 50% of the total recommended actions. This is due in part, to the fact that the development of voluntary beneficial practices are recommended to address both the need for land/water protection and management. For example, a forestry company may develop, for their area of operation, BMPs that result in the maintenance of a mosaic of habitat types, seral stages, and specific important habitat features. As another example, ranchers may use a BMP to manage grazing in such a way as to maintain the composition, density and vigour of natural undergrowth, as well as to minimize soil compaction.



**Figure 7. Percent of recommended actions assigned to each sub-category in BCR 10 Pacific and Yukon Region.**

“Research” and “monitoring” refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see [Research and Population Monitoring Needs](#) in Section 3.

*5.3 Private sector standards and codes* includes adoption of voluntary codes of practice, including sector-specific Beneficial Management Practices for bird conservation. *8.1 Research* and *8.2 Monitoring* refer to specific priority species where information is required before conservation actions can be formulated. For a discussion of broad-scale research and monitoring requirements, see the section on Research and Monitoring Needs.

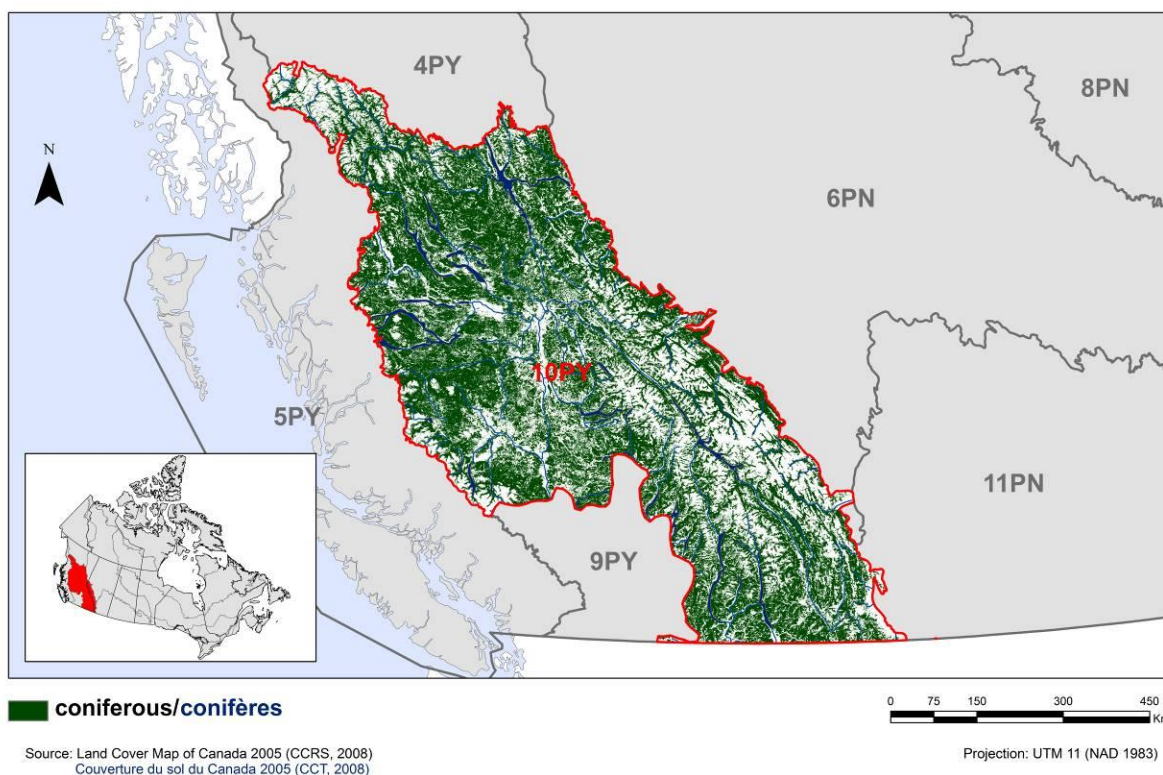
## Section 2: Conservation Needs by Habitat

The following sections provide more detailed information on priority species, their threats and objectives within each of the broad habitat classes that occur in BCR 10 Pacific and Yukon Region. Where appropriate, habitat information is provided at a finer scale than the broad habitat categories in order to coincide with other land management exercises in the region. Some species do not appear in the threats table because their low level threats have not been assigned objectives or actions and/or identified threats are addressed in the [Widespread Issues](#) section of the strategy.

### **Coniferous**

BCR 10 is dominated by coniferous forests (defined as habitat where over 75% of tree basal area is coniferous trees), with 56% of the BCR covered by coniferous forest (CIJV 2009; Fig. 8). In BCR 10, extreme variability in elevation, precipitation and fire frequency combine to create a wide variety of coniferous forest habitats, from fire-maintained ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) forests to moist cedar-hemlock forests, widespread lodgepole pine (*Pinus contorta*) and spruce across the interior plateau, and high-elevation Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). More priority species (28 species, or 36% of the priority species list, all landbirds) use this habitat class than any other (Table 5). The widespread nature of coniferous forest habitats is also reflected in the number of priority species that are considered stewardship species—20, more than in any other habitat type.





**Figure 8. Map of coniferous habitat in BCR 10 Pacific and Yukon Region.**

The primary human impacts on coniferous habitats are the alteration of forest composition and structure through timber harvest and fire suppression (Fig. 10). Timber harvest occurs primarily at mid- to low-elevations, while the highest elevation forests are less impacted. Livestock are grazed in open ponderosa pine and Douglas-fir forests, where grazing has the potential to alter structure of ground vegetation and facilitate the spread of invasive plant species. BCR 10 is also currently experiencing an outbreak of mountain pine beetle (*Dendroctonus ponderosae*) which is unprecedented in scope. To date, 16.3 million hectares of British Columbia's forests have been affected, the majority of which lies within BCR 10 (BC Ministry of Forests and Range 2010). Widespread and intensive mortality of several species of conifers, notably lodgepole and ponderosa pine, combined with large-scale salvage logging, have the potential to negatively impact many forest-dwelling birds and create unique conservation problems for the region (see the section on Mountain Pine Beetle for more information). The most important conservation actions in coniferous habitats are the management of both ongoing timber harvest and the salvage logging and restoration activities associated with mountain pine beetle for the protection of biodiversity, including maintenance of important habitat features for priority species (Table 6). Reintroduction of natural fire regimes, particularly to fire-maintained forest types, and protection of key areas of coniferous habitat are also important.

## Mountain Pine Beetle

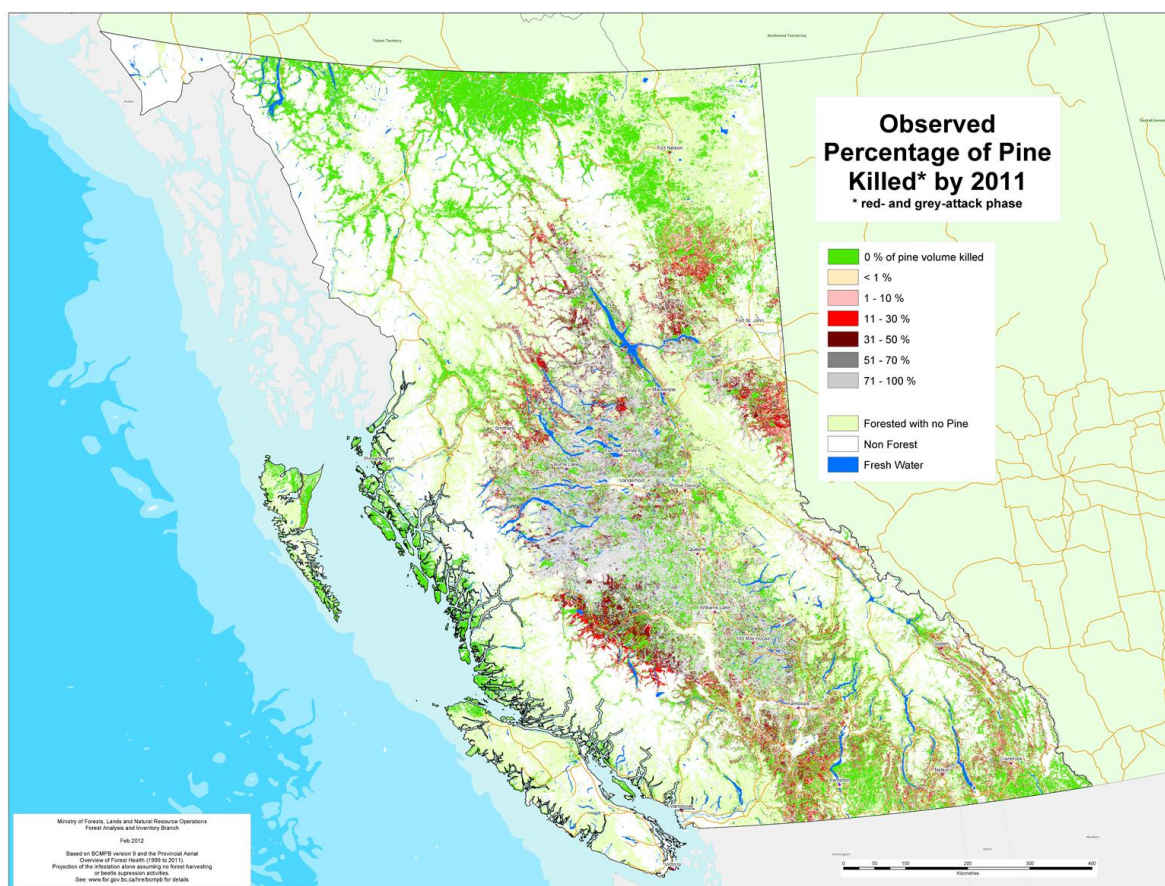
British Columbia is currently experiencing an extensive outbreak of mountain pine beetle (*Dendroctonus ponderosae*). While outbreaks of mountain pine beetle are natural events, the current outbreak is the largest ever recorded ([BC Ministry of Forests, Lands and Natural Resource Operations](#)). The scope of the current outbreak is due, at least in part, to past forest management practices and fire suppression which have increased availability of susceptible (mature) lodgepole pine (*Pinus contorta*) in the interior of British Columbia. Recent climatic warming also favours the mountain pine beetle, with a series of mild winters enabling high overwinter survival of beetle larvae (Austin et al. 2008). In addition to killing mature lodgepole pine, the current mountain pine beetle outbreak is killing ponderosa (*P. ponderosa*), whitebark (*P. albicaulis*) and western white pine (*P. monticola*), spruce trees (*Picea* spp.), and younger lodgepole pine (Westfall and Ebata 2009). Approximately 16.3 million hectares of forest in British Columbia is currently affected (BC Ministry of Forests and Range 2010). The beetle has already attacked most of the mature lodgepole pine in the central plateau region and it is estimated that over 60% of the pine in BCR 10 has been killed as of 2010 (Hectares BC 2012; Fig. 9). While the outbreak is now declining in central areas, in heavily affected areas >80% of mature lodgepole pine are dead and the mountain pine beetle infestation continues to spread to the southern interior and northwards towards the boreal forest (Walton 2010).

Birds that feed on mountain pine beetle adults or larvae (such as woodpeckers, chickadees and nuthatches) can benefit during early stages of infestation due to the increased food resources, but typically decline again after the infestation has peaked (Adamson et al. 2009). Species reliant on canopy foliage and mature forest-dependent species (such as the Golden-crowned Kinglet, Townsend's Warbler and Hammond's Flycatcher) are expected to be negatively impacted by the loss of mature lodgepole pine (Chan-McLeod 2006). In addition, mountain pine beetle-killed trees are often unsuitable for cavity excavators due to their decay patterns, frequently falling before they have decayed enough to be of use (Chan-McLeod 2006).

Mountain pine beetle attack increases risk of high-intensity crown fires during the red-attack phase (when trees are dry and dead but still retain their needles). Fire risk also increases later when the dead trees fall and increase fuel loads on the forest floor (Hawkes 2008). In addition, the large-scale loss of trees to both the mountain pine beetle and salvage logging operations may significantly alter forest hydrology, increasing runoff, erosion, and peak flows in heavily affected watersheds (Austin et al. 2008).

Salvage logging and restoration (planting) activities remove important features such as large live trees, large snags, downed wood and understory vegetation, and increases forest fragmentation. Future coniferous forests will depend on current harvest and restoration strategies, and care must be taken to avoid converting heterogeneous stands to homogenous, even-aged stands which will be highly susceptible to future attack by mountain pine beetle or other host-specific diseases (Klenner 2006, Mahon and Martin 2009; see [Appendix 3](#) for recommendations).

Short-term response to the mountain pine beetle outbreak in BC has now shifted from containment measures to salvage logging. There has been a substantial increase in the allowable annual cut in affected areas to increase the amount of beetle-killed wood that can be harvested before it loses economic value (BC Ministry of Forests and Range 2006b). While there is some guidance on maintaining habitat and biodiversity values in conjunction with salvage logging (Klenner 2006, Snetsinger 2005) it is not legally binding, and to date it does not appear that retention targets are being met (Lewis et al. 2008). Consequently, there are concerns about current and future biodiversity conservation in salvage-logged areas (Lewis et al. 2008). In the longer term, mountain pine beetle mitigation plans include extensive site restoration and replanting efforts to ensure future timber supply, and economic diversification of forestry-dependent towns in heavily affected areas (BC Ministry of Forests and Range. 2006a, b).



**Figure 9. Extent and severity of the mountain pine beetle outbreak in British Columbia.**

**Note:** Original image from Forest Analysis and Inventory Branch, BC Ministry of Forests, Lands and Natural Resource Operations. Available at [www.for.gov.bc.ca/hfp/mountain\\_pine\\_beetle/maps.htm](http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/maps.htm). Accessed 29 November 2012.

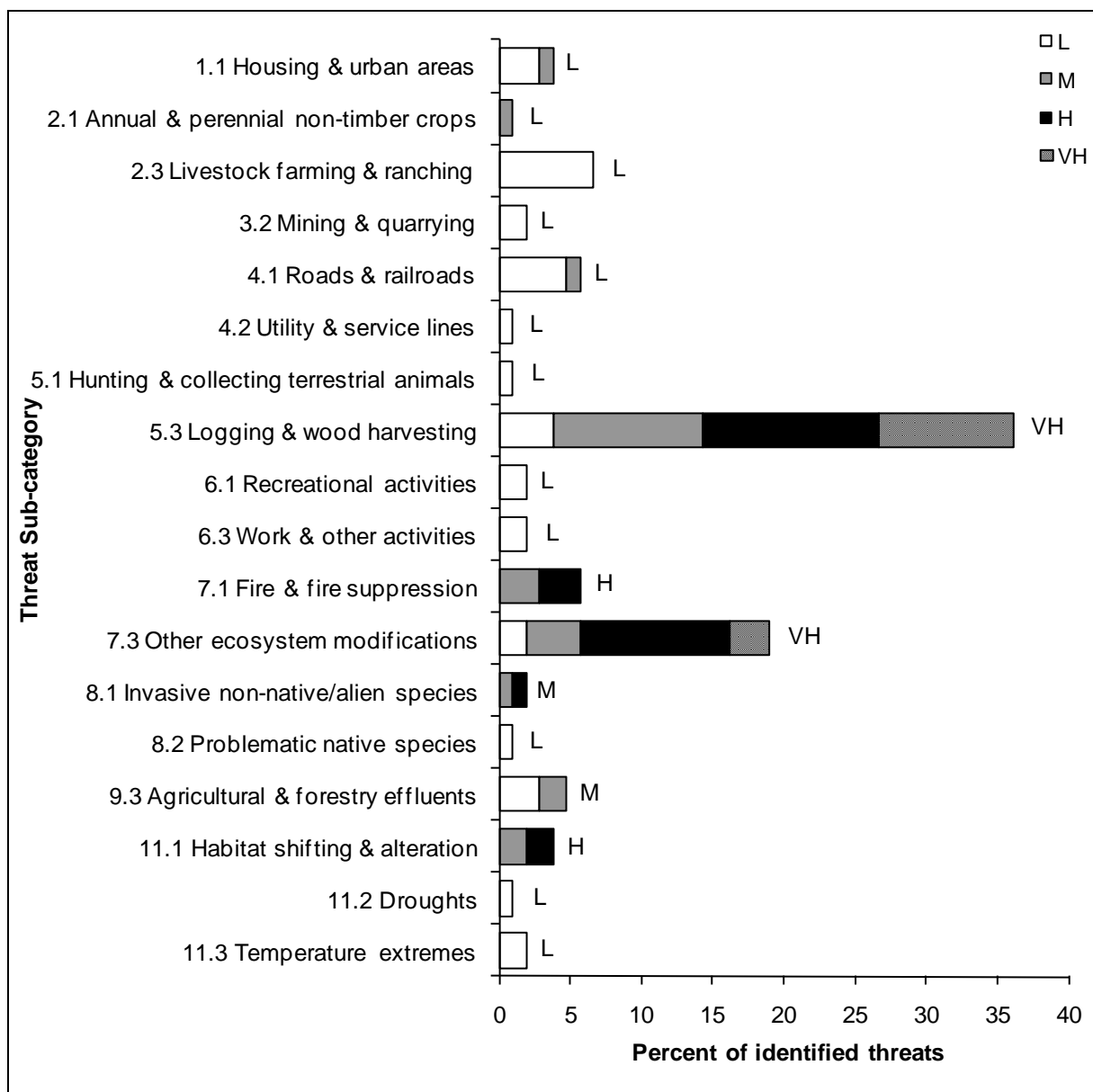
Table 5. Priority species that use coniferous habitat, regional habitat class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Calliope Hummingbird	Ponderosa pine	openings/clearings	Assess / Maintain		Y	Y	
Canyon Wren	Ponderosa pine	cliffs/canyons, outcrops/bluffs	Assess / Maintain	Y			
Cassin's Finch	Ponderosa pine, Douglas-fir	cone crops	Increase 100%		Y	Y	
Cassin's Vireo	Ponderosa pine, Douglas-fir		Assess / Maintain			Y	
Clark's Nutcracker	Whitebark pine, Ponderosa pine	whitebark pine, burns	Assess / Maintain			Y	
Dusky Flycatcher	Douglas-fir, Ponderosa pine	openings/clearings, clearcuts, burns, young aspen copses	Increase 50%			Y	
Dusky Grouse	mature, Ponderosa Pine, Douglas-fir	subalpine meadows, aspen groves, openings/clearings, burns	Assess / Maintain		Y		
Evening Grosbeak	mature, Douglas-fir, Ponderosa pine	fruiting understory shrubs	Increase 100%		Y		
Flammulated Owl	Douglas fir, Ponderosa pine	Cavities	Increase 50%	Y	Y		
Golden-crowned Kinglet	mature, old growth		Assess / Maintain			Y	
Hammond's Flycatcher	mature, old growth		Assess / Maintain			Y	
Lewis's Woodpecker	Ponderosa pine, Douglas-fir	snags, recent burns, openings/clearings, low stem density, cottonwood	Increase 50%	Y	Y		
Northern Goshawk	mature/old growth		Increase 50%		Y	Y	
Northern Pygmy-Owl	mature	Cavities	Assess / Maintain	Y		Y	
Northern Saw-whet Owl	mature, old growth	cavities, snags	Assess / Maintain	Y		Y	
Olive-sided Flycatcher	mature, Douglas-fir, Ponderosa Pine	burns, snags, forest openings	Increase 100%	Y	Y		
Pine Siskin	mature, old growth, Ponderosa pine, lodgepole pine, Douglas fir	cone crops	Increase 100%		Y	Y	
Pygmy Nuthatch	Ponderosa pine, Douglas-fir	cavities, burns	Assess / Maintain		Y		
Red Crossbill	mature, old growth	cone crops	Assess / Maintain		Y	Y	
Rufous Hummingbird	mature, old growth	openings/clearings	Assess / Maintain		Y	Y	
Rusty Blackbird	mature, old growth	forested wetlands, bogs, openings	Increase 100%		Y	Y	
Swainson's Thrush	mature, old growth		Increase 50%		Y	Y	
Townsend's Solitaire	mature	aspen groves, recent burns, openings/clearings, clearcuts, steep dirt banks, fruiting understory shrubs	Assess / Maintain			Y	
Townsend's Warbler	mature, old growth, Douglas-fir		Assess / Maintain			Y	
White-throated Swift	Douglas-fir, Ponderosa pine	cliffs/canyons	Assess / Maintain		Y		
Western Tanager	old growth		Assess / Maintain			Y	
White-tailed Ptarmigan		snow fields	Assess / Maintain			Y	

Table 5 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Williamson's Sapsucker	old growth, mature, Ponderosa pine, Douglas-fir	snags, veteran trees, aspen groves, larch	Recovery objective	Y	Y	Y	

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 10. Percent of identified threats to priority species in coniferous habitat in each threat sub-category.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in coniferous habitat (for example, if 100 threats were identified in total for all priority species in coniferous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in coniferous habitat is shown at the end of each bar (also presented in Table 4).

**Note:** Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *7.3 Other ecosystem modifications* refers to changes in forest structure due to the current Mountain Pine Beetle outbreak. *9.3 Agricultural and forestry effluents* refers to effects of pesticides.



**Table 6. Threats addressed, conservation objectives, recommended actions and priority species affected for coniferous habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Loss of suitable coniferous habitats to rangeland expansion, agricultural conversion and urban development.	1.1 Housing & urban areas 2.1 Annual & perennial non-timber crops 2.3 Livestock farming & ranching	Maintain the quantity and quality of coniferous habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Secure and manage key areas of coniferous habitat for priority birds through various methods such as creation of protected areas, Wildlife Tree Retention Areas, Wildlife Habitat Areas and Old Growth Management Areas. Ensure that the full range of seral stages and habitat types are represented to benefit a wide variety of priority species.	1.1 Site/area protection 5.2 Policies and regulations	Dusky Grouse, Lewis's Woodpecker, Pygmy Nuthatch, Williamson's Sapsucker
Loss of trees to Mountain Pine Beetle infestation.  Loss of coniferous habitats to post-outbreak salvage logging.	5.3 Logging and wood harvesting 7.3 Other ecosystem modifications	Maintain the quantity and quality of coniferous habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Avoid salvage operations in areas with high residual habitat value, such as areas with developed shrub layers and surviving non-pine trees.  Where salvage logging occurs, use partial retention harvesting systems and retain structural features such as deciduous trees, snags, veteran trees, and cavity-bearing trees within retention patches to maintain habitat values for a wide variety of priority bird species.  Focus restoration efforts on stands that are not already regenerating. Convert homogenous stands to multi-species by retaining live non-pine trees and planting a mix of tree species.	5.3 Private sector standards and codes	Cassin's Finch, Cassin's Vireo, Clark's Nutcracker, Dusky Flycatcher, Dusky Grouse, Evening Grosbeak, Flammulated Owl, Golden-crowned Kinglet, Hammond's Flycatcher, Lewis's Woodpecker, Northern Goshawk, Northern Pygmy-owl, Northern Saw-whet Owl, Olive-sided Flycatcher, Pine Siskin, Pygmy Nuthatch, Red Crossbill, Swainson's Thrush, Williamson's Sapsucker

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 6 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Loss of suitable coniferous habitats and changes in structural diversity due to forest management.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of coniferous habitats.	<p>1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.</p> <p>1.4 Maintain important habitat features on the landscape.</p>	<p>Use a variety of methods, such as creation of protected areas, Wildlife Tree Retention Areas, Wildlife Habitat Areas and Old Growth Management Areas to manage forests to maintain a mosaic of all habitat types and seral stages.</p> <p>Use harvest techniques such as selective cutting and partial retention that mimic natural disturbance regimes and retain important habitat features for priority species.</p> <p>Maintain structural diversity by managing for a variety of tree species in multi-aged stands, with well-developed shrub understory and canopy closure. Maintain key habitat features such as large veteran trees and snags.</p> <p>Protect all remaining old-growth stands and maintain large contiguous tracts of mature trees. Maximize connectivity of old-growth and mature forest patches.</p>	5.3 Private sector standards and codes	Cassin's Finch, Cassin's Vireo, Dusky Grouse, Evening Grosbeak, Golden-crowned Kinglet, Hammond's Flycatcher, Lewis's Woodpecker, Northern Goshawk, Northern Pygmy-Owl, Northern Saw-whet Owl, Olive-sided Flycatcher, Pine Siskin, Pygmy Nuthatch, Red Crossbill, Rusty Blackbird, Swainson's Thrush, Townsend's Warbler, Western Tanager, Williamson's Sapsucker
Changes in forest structure due to fire suppression.	7.1 Fire & fire suppression	Maintain and enhance the quality and diversity of coniferous habitats.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	<p>Wherever possible, re-introduce or mimic historical fire regimes in fire-dependent ecosystems to maintain a full range of structural stages and features such as fire-created snags. Conduct prescribed burning in early spring, fall, or winter.</p> <p>Avoid post-fire salvage logging.</p>	2.3 Habitat and natural process restoration	Clark's Nutcracker, Flammulated Owl, Lewis's Woodpecker, Pine Siskin, Pygmy Nuthatch, Williamson's Sapsucker
Degradation of coniferous forest habitats due to grazing practices.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of coniferous habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Manage grazing to maintain the composition, density and vigour of natural undergrowth and avoid soil damage. Maintain a well-developed woody and herbaceous understory.	5.3 Private sector standards and codes	Dusky Flycatcher, Dusky Grouse, Flammulated Owl, Hammond's Flycatcher, Lewis's Woodpecker, Olive-sided Flycatcher
Reduction in invertebrate prey availability due to pest control.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of	5.1 Maintain natural food webs and prey sources.	<p>Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate species.</p> <p>If available, use biological control for specific noxious species, rather than chemical control.</p>	5.3 Private sector standards and codes	Flammulated Owl, Lewis's Woodpecker, White-throated Swift, Williamson's Sapsucker



Table 6 continued

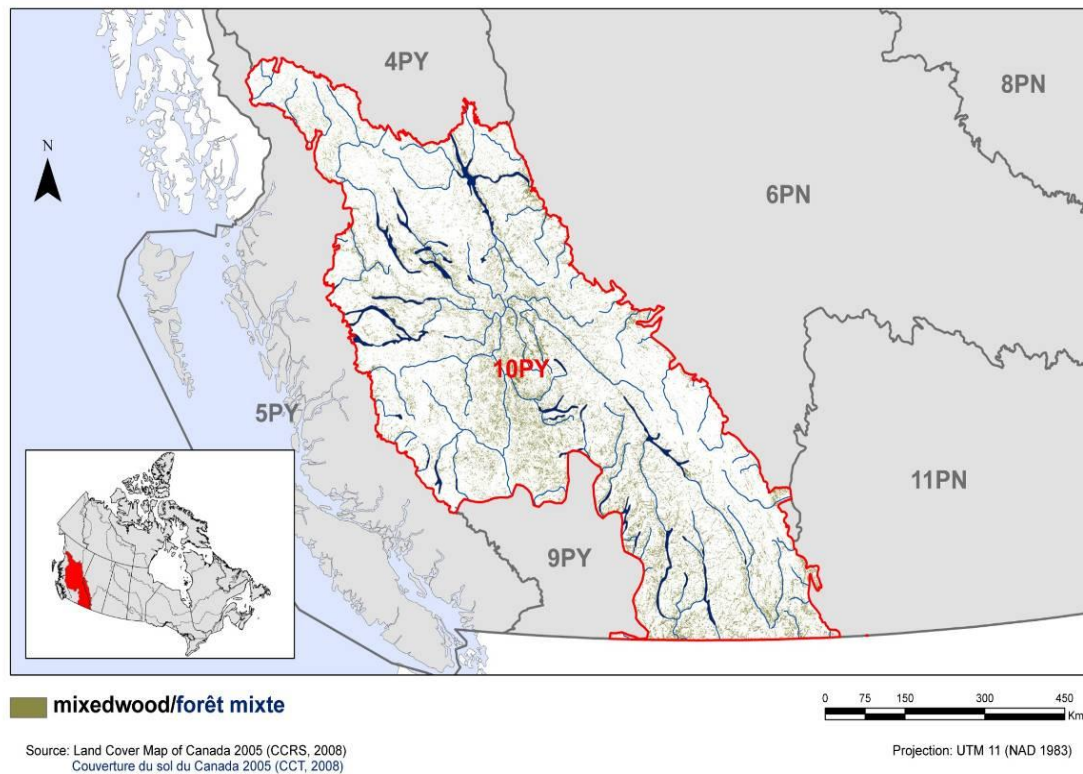
Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
		pesticides.				
Loss of whitebark pine, a key food source for Clark's Nutcracker, to blister rust.	8.1 Invasive non-native/alien species	Maintain and enhance the quality and diversity of coniferous habitats.	5.1 Maintain natural food webs and prey sources.	Support and expand existing blister rust-resistant whitebark pine research and restoration initiatives.	8.1 Research	Clark's Nutcracker
Harvested areas may function as ecological traps.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of coniferous habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Research is needed to determine if and how clearcuts function as ecological traps for Olive-sided Flycatcher.	8.1 Research	Olive-sided Flycatcher
Lack of nesting cavities and loss of cavity excavating birds/animals.	5.3 Logging & wood harvesting 7.3 Other ecosystem modifications	Ensure sufficient nesting sites are available for cavity nesting priority species.	1.4 Maintain important habitat features on the landscape.	Maintain features attractive to cavity excavators on the landscape, such as large, veteran trees and snags (including deciduous trees). Retain existing cavity-bearing trees and surrounding foraging habitat.  Consider initiating well-managed nest box programs in areas lacking cavity-bearing trees.	1.2 Resource and habitat protection 3.2 Species recovery 5.3 Private sector standards and codes	Flammulated Owl, Northern Pygmy-Owl
Competition from European Starlings limits availability of nesting cavities.	8.1 Invasive non-native/alien species	Ensure that nest site competition is not limiting Lewis's Woodpecker populations.	3.1 Reduce competition with invasive species.	Research is required to understand under what conditions and the extent to which nest-site competition with European Starlings may be limiting Lewis's Woodpecker populations.  While waiting for research results, retain cavity-bearing trees and snags as nesting habitat. Initiate nest-box programs in areas lacking cavity-bearing trees and snags.	1.2 Resource and habitat protection 3.2 Species recovery 8.1 Research	Lewis's Woodpecker

Table 6 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Decreased productivity and nest failure or abandonment due to disturbance from quarrying activity or rock climbing.	3.2 Mining & quarrying 6.1 Recreational activities 6.2 Work and other activities	Avoid disturbance of nesting priority species.	4.1 Reduce disturbance from human recreation.  4.2 Reduce disturbance from industrial or work activity.	Prevent rock climbing on or near occupied Canyon Wren or White-throated Swift nesting habitat from May through July. Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.  Prevent removal of talus rock on or near these priority species' nesting and foraging habitats.  Implement programs to monitor the use of cliffs by climbers and to evaluate spatial and temporal changes in number of birds, including changes in the number of invasive species.	4.3 Awareness and communications 5.3 Private sector standards and codes 8.2 Monitoring	Canyon Wren, White-throated Swift

## Mixed Wood

Mixed-wood habitats (where coniferous tree basal area is less than 75% of total tree basal area) occur throughout BCR 10, typically dispersed within more extensive coniferous forest wherever disturbance or soils have allowed a substantial deciduous component to develop (Fig. 11). Mixed-wood forests are moderately common, with 7.7% of the BCR classified as mixed-wood forest (CIJV 2009). Ten (10) priority species have been identified as using mixed-wood habitats (9 landbirds, 1 waterbird; Table 7).



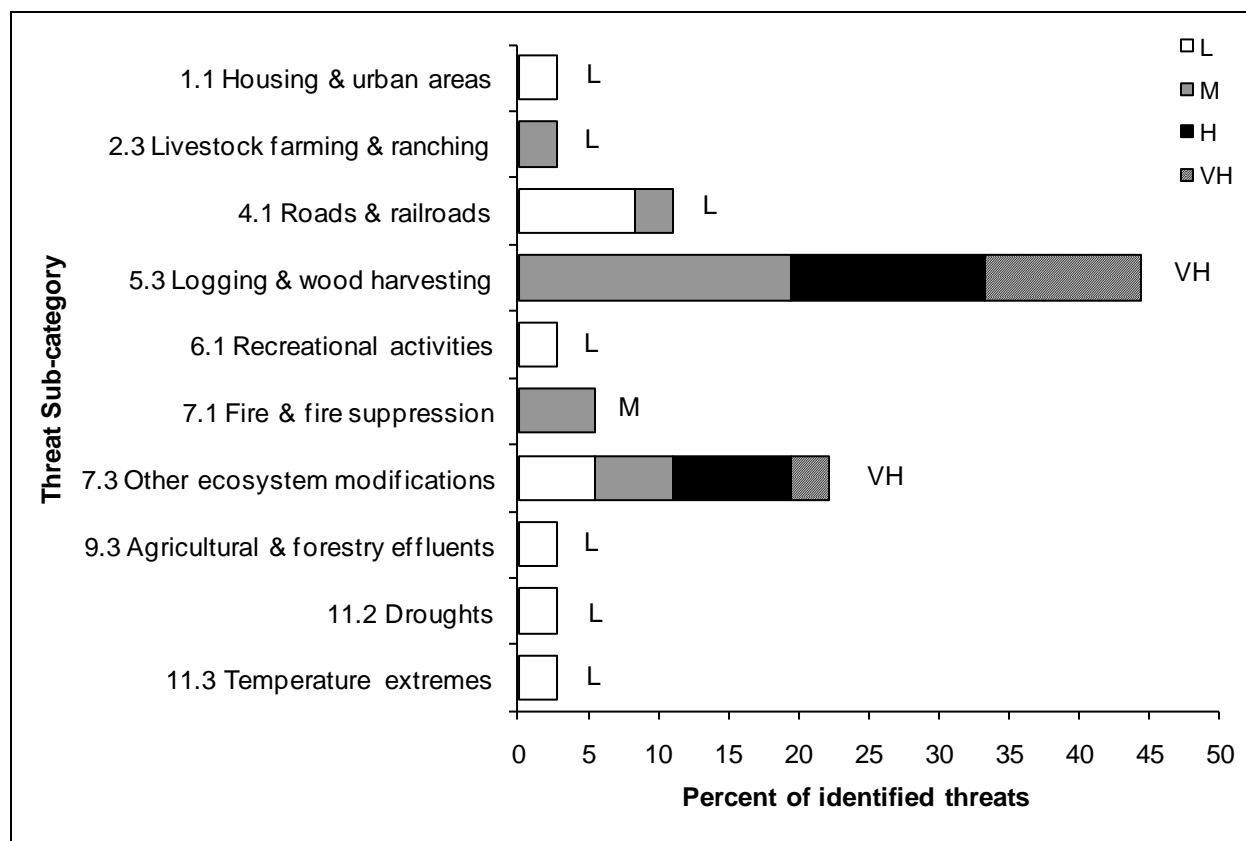
**Figure 11. Map of mixed wood habitat in BCR 10 Pacific and Yukon Region.**

The primary threats in mixed wood forests, as in coniferous forests, are timber harvesting, widespread mortality of mature conifers due to the current mountain pine beetle outbreak in British Columbia, and associated salvage logging activities (see the section on Mountain Pine Beetle for more information; Fig. 12). Again similar to coniferous habitats, the most important conservation action in this habitat is the management of ongoing timber harvest, salvage logging and mountain pine beetle restoration activities (e.g., replanting efforts) for the protection of biodiversity, including maintenance of habitat features for priority species (Table 8).

**Table 7. Priority species that use mixed wood habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Cassin's Vireo	Mature		Assess / Maintain			Y	
Evening Grosbeak	Mature	fruiting understory shrubs	Increase 100%		Y		
Great Blue Heron	Mature	veteran trees, cottonwood riparian	Assess / Maintain	Y			
Northern Pygmy-Owl	Mature	cavities	Assess / Maintain	Y		Y	
Northern Saw-whet Owl	mature, old growth	cavities, openings/clearings, snags	Assess / Maintain	Y		Y	
Olive-sided Flycatcher	Mature	burns, snags, forest openings	Increase 100%	Y	Y		
Pine Siskin	mature, old growth	cone crops	Increase 100%		Y	Y	
Red-naped Sapsucker	Mature	cavities, aspen copses	Assess / Maintain			Y	
Ruffed Grouse	Mature		Assess / Maintain			Y	
Townsend's Warbler	mature, old growth		Assess / Maintain			Y	

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 12. Percent of identified threats to priority species in mixed wood habitat in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in mixed wood habitat (for example, if 100 threats were identified in total for all priority species in mixed wood habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in mixed wood habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *7.3 Other ecosystem modifications* refers primarily to changes in forest structure due to the current Mountain Pine Beetle outbreak.

**Table 8. Threats addressed, conservation objectives, recommended actions, and priority species affected for mixed wood habitat in BCR 10 Pacific and Yukon Region.**

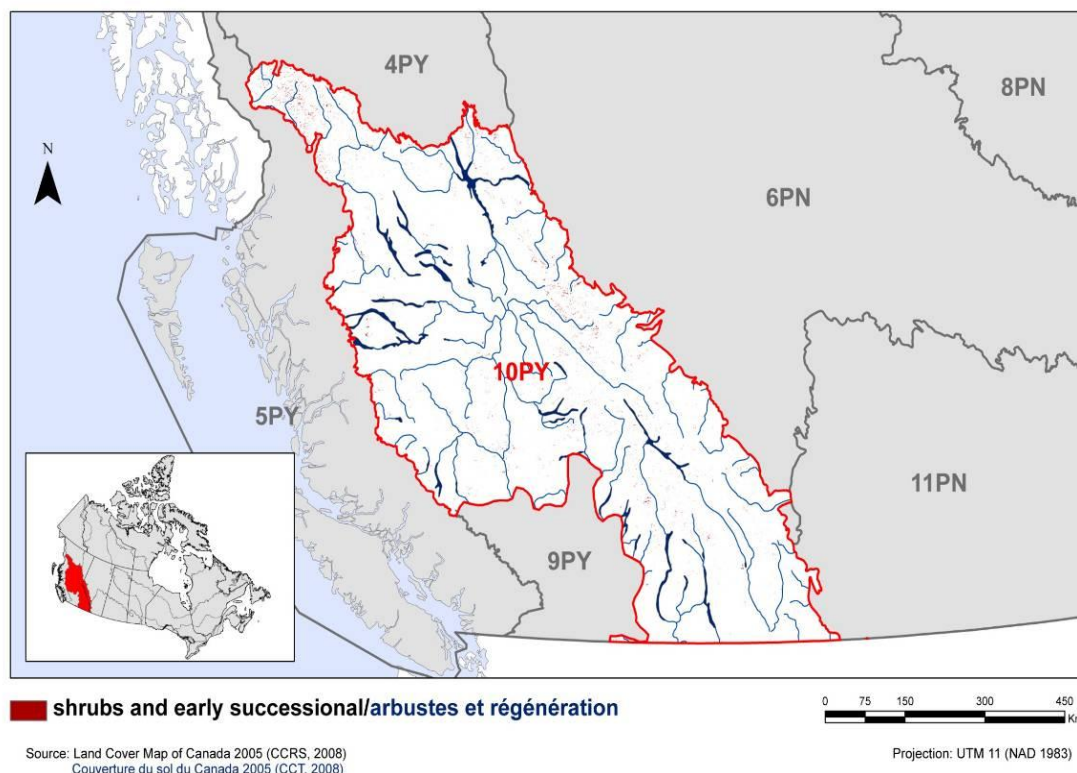
Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Loss of trees to Mountain Pine Beetle infestation.  Loss of mixed-wood habitats to post-outbreak salvage logging.	5.3 Logging & wood harvesting 7.3 Other ecosystem modifications	Maintain the quantity and quality of mixed wood habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Avoid salvage operations in areas with high residual habitat value, such as areas with developed shrub layers and surviving non-pine trees.  Where salvage logging occurs, use partial retention harvesting systems and retain structural features such as deciduous trees, snags, veteran trees, and cavity-bearing trees within retention patches to maintain habitat values for a wide variety of priority forest species.  Focus restoration efforts on stands that are not already regenerating. Convert homogenous stands to multi-species by retaining live non-pine trees and planting a mix of species.	5.3 Private sector standards and codes	Cassin's Vireo, Evening Grosbeak, Northern Pygmy-Owl, Northern Saw-whet Owl, Olive-sided Flycatcher, Pine Siskin
Changes in structural diversity due to forest management.  Loss of important habitat features to forest management.	5.3 Logging & wood harvesting 7.3 Other ecosystem modifications	Maintain and enhance the quality and diversity of mixed wood habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.  1.4 Maintain important habitat features on the landscape.	Use a variety of methods, such as creation of protected areas, Wildlife Tree Retention Areas, Wildlife Habitat Areas and Old Growth Management Areas to manage forests to maintain a mosaic of all habitat types and seral stages.  Use harvest techniques such as selective cutting and partial retention that mimic natural disturbance regimes and retain important habitat features such as a deciduous component, large veteran trees, snags, and cavity-bearing trees.  Increase structural diversity within managed areas by encouraging understory growth and mixed-age stands.	5.3 Private sector standards and codes	Cassin's Vireo, Evening Grosbeak, Great Blue Heron, Northern Pygmy-Owl, Northern Saw-whet Owl, Olive-sided Flycatcher, Pine Siskin, Red-naped Sapsucker, Ruffed Grouse, Townsend's Warbler
Changes in structural diversity due to fire suppression.	7.1 Fire & fire suppression	Maintain and enhance the quality and diversity of mixed wood habitats.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Wherever possible, re-introduce or mimic historical fire regimes in fire-dependent ecosystems to maintain a full range of structural stages and features such as fire-created snags. Conduct prescribed burning in early spring, fall, or winter.  Avoid post-fire salvage logging.	2.3 Habitat and natural process restoration	Red-naped Sapsucker, Ruffed Grouse

Table 8 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Degradation of woodland habitat due to livestock activity.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of mixed wood habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Manage grazing to maintain the composition, density and vigour of natural undergrowth and avoid soil damage. Maintain a well-developed woody and herbaceous understory.	5.3 Private sector standards and codes	Red-naped Sapsucker
Harvested areas may function as ecological traps.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of mixed wood habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Research is needed to determine if and how clearcuts function as ecological traps for Olive-sided Flycatcher.	8.1 Research	Olive-sided Flycatcher
Lack of nesting cavities and loss of cavity excavators.	7.3 Other ecosystem modifications	Ensure sufficient nesting sites are available for cavity nesting priority species.	1.4 Maintain important habitat features on the landscape.	Maintain features attractive to cavity excavators on the landscape, such as large, veteran trees and snags (including deciduous trees). Retain existing cavity-bearing trees and surrounding foraging habitat.  Consider initiating well-managed nest box programs in areas lacking cavity-bearing trees.	1.2 Resource and habitat protection 3.2 Species recovery	Northern Pygmy-Owl

### ***Shrub/Early Successional***

Shrub and early successional habitats are transient, occurring where disturbance has removed the tree cover and the vegetation is dominated by shrubby, early seral forms (Fig. 13). Six priority species, all landbirds, were identified as using this habitat type (Table 9).



**Figure 13. Map of shrub/early successional habitat in BCR 10 Pacific and Yukon Region.**

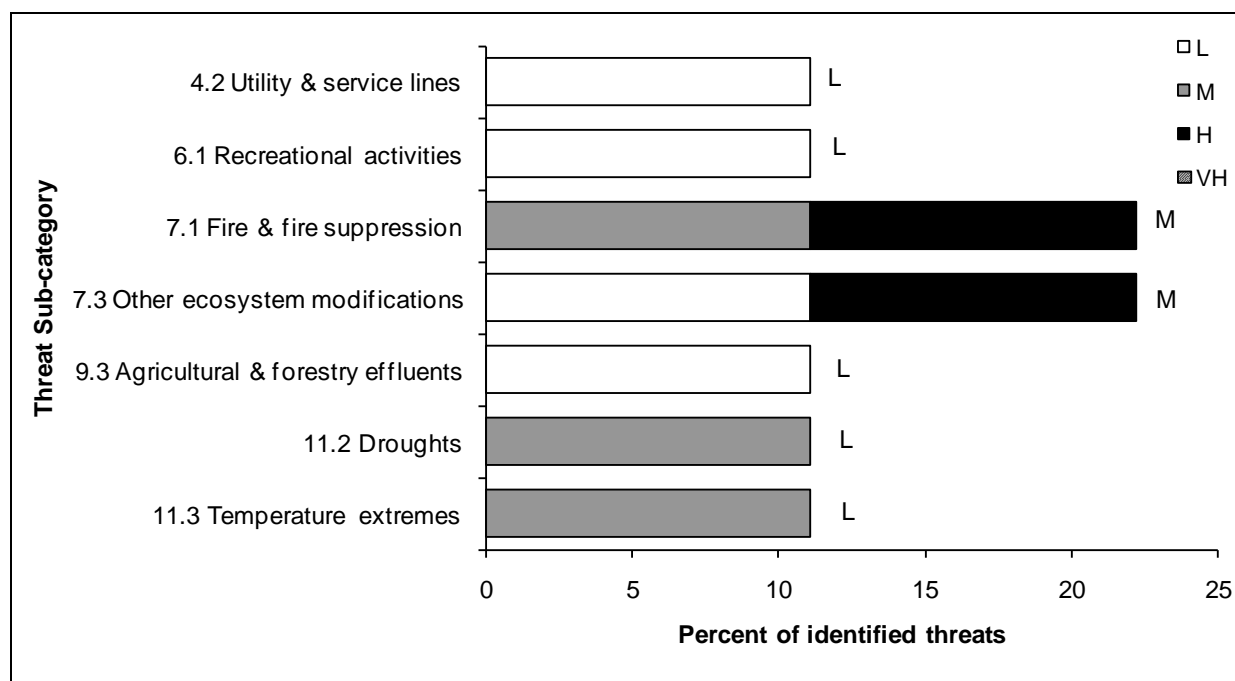
Early seral forest habitat occurs wherever wildfire, timber harvest or other disturbances have created successional openings within forests. This habitat type is lost as succession continues and young forests mature. Wildfire suppression also reduces the creation of new natural successional openings (Fig. 14). While new patches of habitat are created by timber harvest, they are typically managed for accelerated conifer regrowth, which may reduce their suitability for various priority species (Betts et al. 2010). Key actions to address these threats include management of timber harvest to maintain suitable, high-quality habitat for species that use early successional habitats and the reintroduction of natural fire regimes (Table 10).



**Table 9. Priority species that use shrub and early successional habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Common Nighthawk	early seral	recent burns, clearcuts, rocky clearings, outcrops/bluffs	Increase 100%	Y			
Dusky Flycatcher	early seral	openings/clearings, clearcuts, burns, young aspen copses	Increase 50%			Y	
Lazuli Bunting	early seral	aspen groves, cottonwood riparian, recent burns, wet draws in shrubsteppe	Maintain current			Y	
Ruffed Grouse	early seral	.	Assess / Maintain			Y	
Sharp-tailed Grouse	early seral	dense shrub, riparian adjacent to open areas, lek sites, aspen copses	Increase 50%	Y	Y		
Willow Flycatcher	early seral	openings/clearings	Assess / Maintain		Y	Y	

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 14. Percent of identified threats to priority species in shrub and early successional habitat in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in shrub and early successional habitat (for example, if 100 threats were identified in total for all priority species in shrub and early successional habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in shrub and early successional habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. 7.3 Other ecosystem modifications includes changes in forest structure and availability of early seral habitat due to forest regrowth.

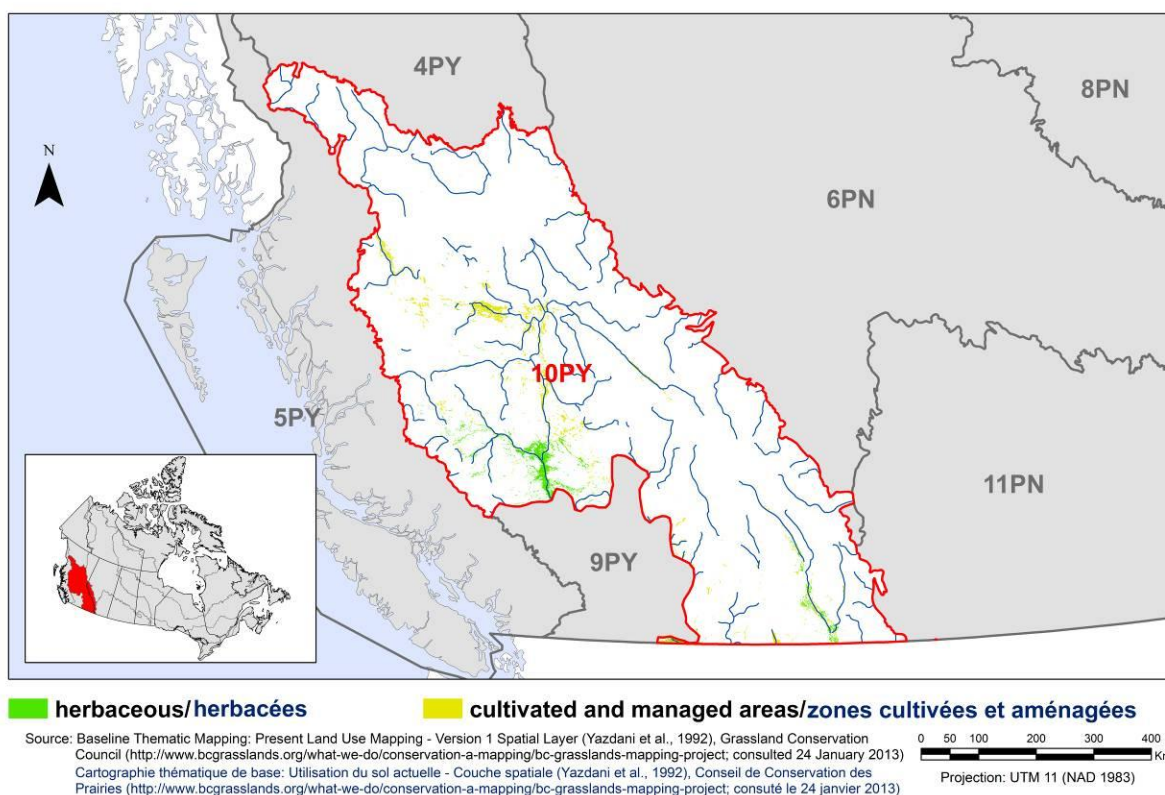
**Table 10. Threats addressed, conservation objectives, recommended actions, and priority species affected for shrub and early successional habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Forest encroachment due to fire suppression.  Regeneration of forest in successional openings.	7.1 Fire & fire suppression 7.3 Other ecosystem modifications	Maintain key habitat features in forests, including deciduous shrub layers in successional openings.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.  1.3 Ensure the continuation of natural processes that maintain bird habitat.	Wherever possible, re-introduce or mimic historical fire regimes to create natural successional openings.  Manage forests to maintain the full range of naturally-occurring species and seral stages, including young and regenerating forest. Manage forests so that stand structure, composition and disturbance patterns mimic natural regimes.	2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Common Nighthawk, Ruffed Grouse

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the **Error! Reference source not found.** section, 3) identified threats in this habitat are of low magnitude.

## Herbaceous

The herbaceous habitat class includes grassland, shrubsteppe and agricultural land. In BCR 10, most grasslands and shrubsteppe are found along valley bottoms and adjacent benches of the Fraser, Chilcotin and Kootenay rivers. Small, widely scattered patches of grassland on steep, south-facing slopes also occur throughout the BCR (Wikeem and Wikeem 2004; Fig. 15). Pastures, hayfields and annual crops are more widespread, occurring where soils and water permit. Agricultural land such as pastures and row crops cover 0.7% of the BCR (CIJV 2009), and native grassland and shrubsteppe currently cover approximately 0.6% of the BCR (Grasslands Conservation Council of BC 2004). Grassland associated birds are exhibiting continent-wide declines, and are declining more than any other bird group (North American Bird Conservation Initiative, U.S. Committee, 2009). Twelve of the 16 priority species associated with herbaceous habitats in BCR 10 (13 landbirds, 2 shorebirds, and 1 waterfowl; Table 11) are listed as at risk either federally or provincially (Alberta or British Columbia).



**Figure 15. Map of herbaceous habitat in BCR 10 Pacific and Yukon Region.**

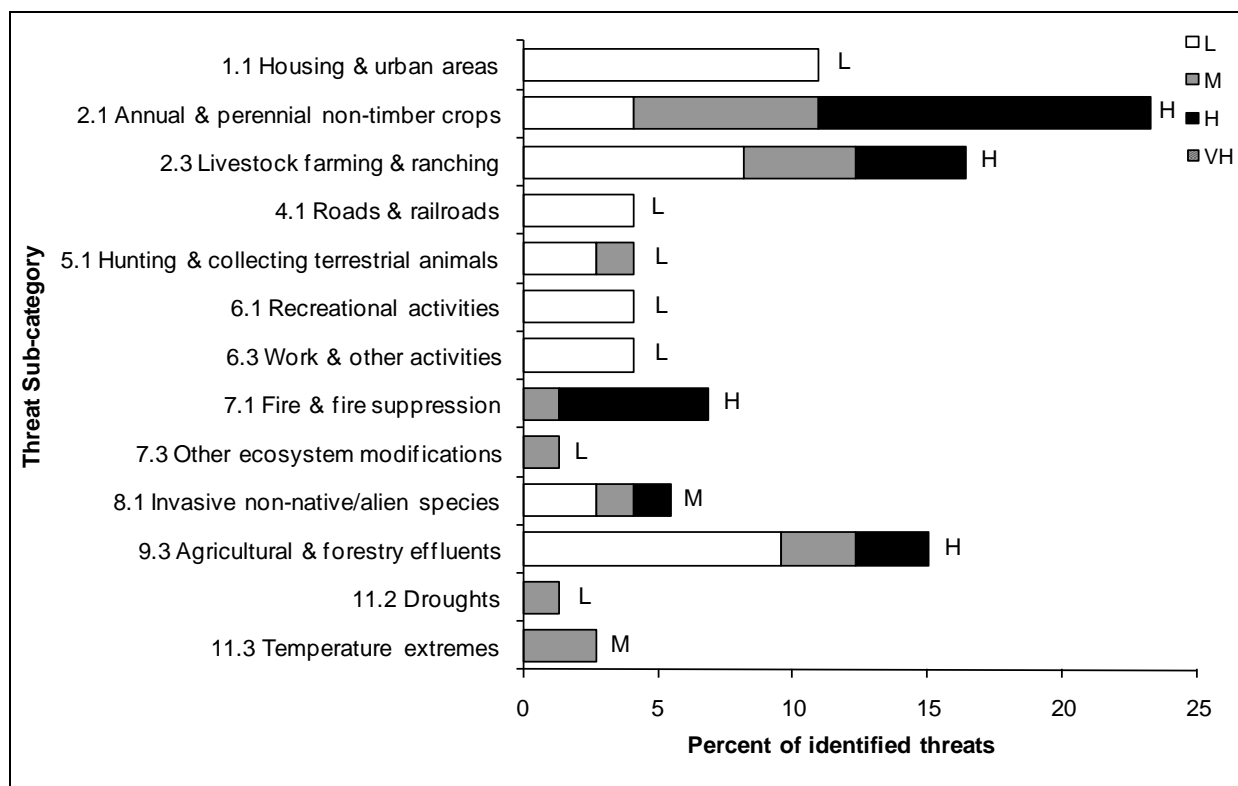
Overall, grasslands and shrubsteppe form only a small portion of the BCR. However, they are one of the most highly impacted habitats by human activities. Less than 1% of British Columbia's native grasslands remain in pristine condition. The vast majority have either been lost to urban development, converted to agriculture (primarily as pasture or hay crops) or are grazed as rangeland (Harding 2009). While much of the conversion of grasslands and

shrubsteppe to other uses occurred in the past, these pressures continue to impact remaining grasslands. Loss of grassland and shrubsteppe to agricultural expansion or intensification, grazing practices which degrade grassland and shrubsteppe habitats and facilitate the spread of invasive plant species, and agricultural practices such as pesticide spraying and mowing of hayfields during the breeding season are the largest ongoing threats to priority birds that use herbaceous habitats in BCR 10 (Fig. 16). Forest encroachment into grassland and shrubsteppe due to fire suppression also contribute to habitat loss. Key actions to conserve priority grassland birds include protection of remaining native grasslands and shrubsteppe, management of grazing to avoid habitat degradation and maintain habitat suitability for priority species, increasing the use of beneficial management practices for biodiversity and bird conservation in agriculture, and reintroduction of natural fire regimes (Table 12).

**Table 11. Priority species that use herbaceous habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat Features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Barn Swallow	native grassland	openings/clearings, man-made ledges	Increase 100%	Y			
Bobolink	native grassland, hayfield/tame pasture		Assess / Maintain	Y			
Canada Goose	hayfield/tame pasture, row crop, old field, native grassland		Maintain current				Y
Common Nighthawk	old field, native grassland, hayfield/tame pasture	recent burns, clearcuts, rocky clearings, outcrops/bluffs	Increase 100%	Y			
Dusky Grouse	native grassland, shrubsteppe	subalpine meadows, aspen groves, openings/clearings, burns	Assess / Maintain		Y		
Ferruginous Hawk	native grassland, hayfield/tame pasture	nest trees on edge of/within grassland	Assess / Maintain	Y	Y		
Horned Lark	native grassland		Increase 50%	Y			
Lark Sparrow	native grassland, pasture, shrubsteppe		Assess / Maintain	Y			
Long-billed Curlew	native grassland, hayfield/tame pasture, row crop, old field		Maintain current	Y	Y		
Northern Harrier	old field, native grasslands		Increase 50%		Y		
Prairie Falcon	native grassland, old field, shrubsteppe	cliffs/canyons, outcrops/bluffs	Assess / Maintain	Y			
Sharp-tailed Grouse	native grassland, shrubsteppe	dense shrub, riparian adjacent to open areas, lek sites, aspen copses	Increase 50%	Y	Y		
Short-eared Owl	native grassland, old field		Increase 50%	Y	Y		
Swainson's Hawk	native grassland, hayfield/tame pasture, old field	nest trees on edge of or within grassland	Increase 100%	Y	Y		
Upland Sandpiper	native grassland		Assess / Maintain	Y			
White-throated Swift	native grassland	cliffs/canyons	Assess / Maintain		Y		

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 16. Percent of identified threats to priority species in herbaceous habitat in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in herbaceous habitat (for example, if 100 threats were identified in total for all priority species in herbaceous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in herbaceous habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. 6.1 *Recreation activities* and 6.3 *Work & other activities* refer to disturbance of birds due to human activity. 8.1 *Invasive non-native/alien species* refers primarily to degradation of habitat due to invasive plant species. 9.3 *Agricultural and forestry effluents* refers to the effects of pesticide use.

**Table 12. Threats addressed, conservation objectives, recommended actions, and priority species affected for herbaceous habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Loss of habitat to urban development.  Loss of habitat to agricultural activities.	1.1 Housing & urban areas 2.1 Annual & perennial non-timber crops	Maintain the quantity and quality of grassland habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Secure and manage herbaceous habitat for priority birds through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans, stewardship agreements, and Environmental Farm Plans.  Avoid fragmenting existing grassland tracts. A single large reserve is better than several small reserves for edge sensitive priority bird species.  Reserves should be more or less circular or square in shape to maximize the core area and minimize edge effects for edge sensitive priority bird species.	1.1 Site/area protection	Bobolink, Common Nighthawk, Dusky Grouse, Ferruginous Hawk, Horned Lark, Lark Sparrow, Long-billed Curlew, Northern Harrier, Prairie Falcon, Sharp-tailed Grouse, Short-eared Owl, Swainson's Hawk, Upland Sandpiper
Forest encroachment due to fire suppression.	7.1 Fire & fire suppression	Maintain the quantity and quality of grassland habitats.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Wherever possible, re-introduce or mimic historic fire regimes to maintain fire-dependent ecosystems. Conduct prescribed burning in early spring, fall, or winter.	2.3 Habitat and natural process restoration	Lark Sparrow, Long-billed Curlew, Prairie Falcon, Sharp-tailed Grouse, Upland Sandpiper
Degradation of grassland habitat due to grazing practices.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of grassland habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Use grazing systems that contain rest, rotation, deferment and prescribed burning to produce a mosaic of habitat patches of varying density and height on the landscape, which benefit a variety of grassland species.  Plan livestock grazing to maintain the desired structure and density of the plant community for priority species. Grazing levels may not be the same for each of these species.  Where necessary, use fencing to control livestock access.	5.3 Private sector standards and codes	Bobolink, Dusky Grouse, Ferruginous Hawk, Northern Harrier, Sharp-tailed Grouse, Short-eared Owl, Upland Sandpiper

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.



Table 12 continued

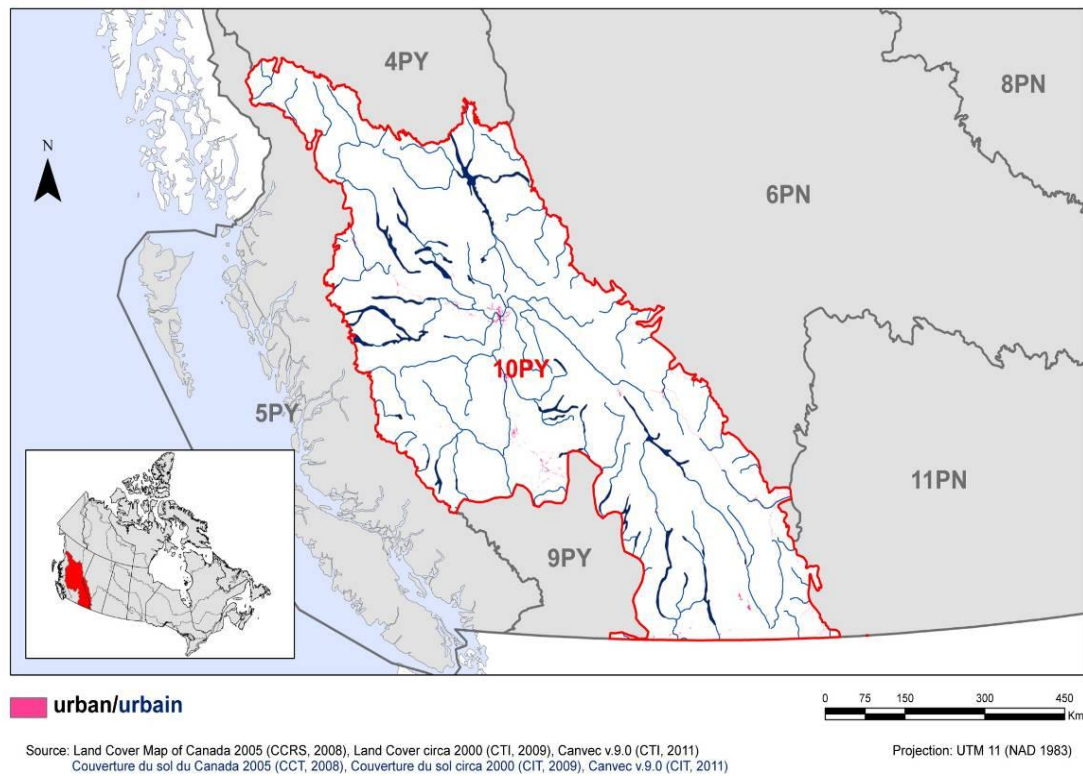
Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate species.  If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Barn Swallow, Bobolink, Common Nighthawk, Ferruginous Hawk, Lark Sparrow, Northern Harrier, Swainson's Hawk, White-throated Swift
Nests destroyed by haying, mowing and harvesting practices.	2.1 Annual & perennial non-timber crops	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	2.9 Reduce nest destruction.	Avoid use of heavy equipment in fields supporting grassland birds during the breeding season.  Delay spring mowing of hayfields until post-breeding period (mid or late July).  To minimize the risk of affecting any late nesters, mow or plow from the center of the field outwards, use flush bars, and slow equipment if birds are flushed to give adults and flightless/newly fledged young time to escape.	5.3 Private sector standards and codes	Bobolink, Long-billed Curlew, Northern Harrier, Sharp-tailed Grouse, Short-eared Owl, Upland Sandpiper
Removal of nests by landowners.  Loss of nesting sites (building modification, building removal).	5.1 Hunting & collecting terrestrial animals  7.3 Other ecosystem modifications	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	1.4 Maintain important habitat features on the landscape.  2.9 Reduce nest destruction.	Research is needed to quantify the distribution and intensity of nest removal and assess the threat this behaviour poses to Barn Swallow populations.  Increase public awareness of the Barn Swallow, its benefits, and current legal protection to increase stewardship and eliminate destruction of nests.  Encourage landowners to incorporate nesting ledges on out-buildings in habitat suitable for Barn Swallows.	4.3 Awareness and communications 8.1 Research	Barn Swallow
Disturbance of nesting raptors may cause abandonment.	6.3 Work & other activities	Avoid disturbance of nesting raptors.	4.2 Reduce disturbance from industrial or work activity.	Maintain natural, undisturbed vegetation around all known or suspected raptor nest sites.  Establish buffers around active nest sites during the breeding season.  Increase public awareness of the impacts of human disturbance on priority species, and methods to	1.1 Site/area protection 4.3 Awareness and communications	Ferruginous Hawk, Prairie Falcon

Table 12 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
				minimize such disturbance.		
Cattle can trample and destroy nests of ground-nesting birds.	2.3 Livestock farming & ranching	Minimize loss of ground nests to trampling by cattle.	2.9 Reduce nest destruction.	Allow longer rest periods (6 weeks or more) during the breeding season in rotationally-grazed systems. Maintain some pastures as “refuge areas” that are completely undisturbed during the breeding season.	5.3 Private sector standards and codes	Horned Lark, Lark Sparrow, Northern Harrier, Upland Sandpiper
Invasive plant species alter grassland structure and suitability.	8.1 Invasive non-native/alien species	Eliminate or control invasive plant species while preventing further introductions.	3.5 Prevent and control the spread of invasive and exotic species.	<p>Eliminate or control non-native weeds through mechanical control, biological control, grazing or herbicides (as a last resort). In some sites, prescribed burning may enhance native plant growth and reduce non-native, invasive weeds.</p> <p>Increase public awareness of invasive plant species and measures to control their spread (such as regular cleaning of boats, vehicles and equipment, and using only native species for gardening, landscaping and re-vegetation purposes), to prevent establishment of additional invasive species.</p>	<p>2.2 Invasive/problematic species control</p> <p>4.3 Awareness and communications</p>	Long-billed Curlew, Upland Sandpiper, Sharp-tailed Grouse

## Urban

The urban habitat class consists of urban, suburban and industrial areas where developments such as buildings, roads, parking lots and other impervious surfaces are common. There is relatively little urban development in BCR 10, and urban areas cover only 0.1% of the BCR (CIJV 2009; Fig. 17). Prince George (83,000 inhabitants) is the largest urban center (Statistics Canada 2008). Only one priority species, the Barn Swallow, was identified as using urban habitats in BCR 10 (Table 13).



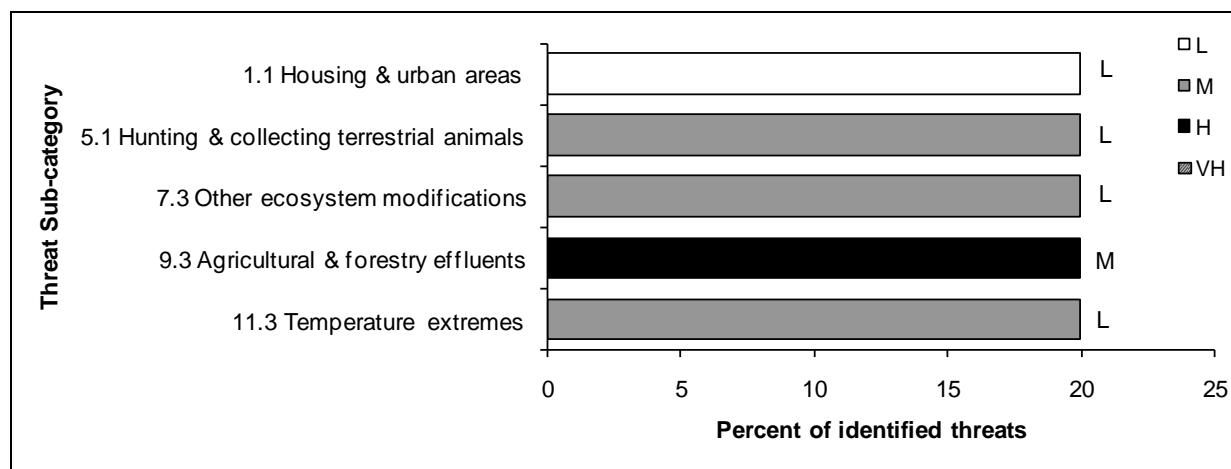
**Figure 17. Map of urban habitat in BCR 10 Pacific and Yukon Region.**

Within urban habitats, the primary threats facing Barn Swallows are the loss of nesting sites on buildings, active removal of their nests from buildings, potential loss of prey due to pesticide use, and climate change (Fig. 18). The primary actions recommended to address these threats are to reduce pesticide use and increase public awareness of the species and its needs to reduce persecution (Table 14). See the [Widespread Issues](#) section for objectives relating to climate change.

**Table 13. Priority species that use urban habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Barn Swallow	n/a	openings/clearings, man-made ledges	Increase 100%	Y			

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 18. Percent of identified threats to priority species in urban habitat in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in urban habitat (for example, if 100 threats were identified in total for all priority species in urban habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in urban habitat is shown at the end of each bar (also presented in Table 4).

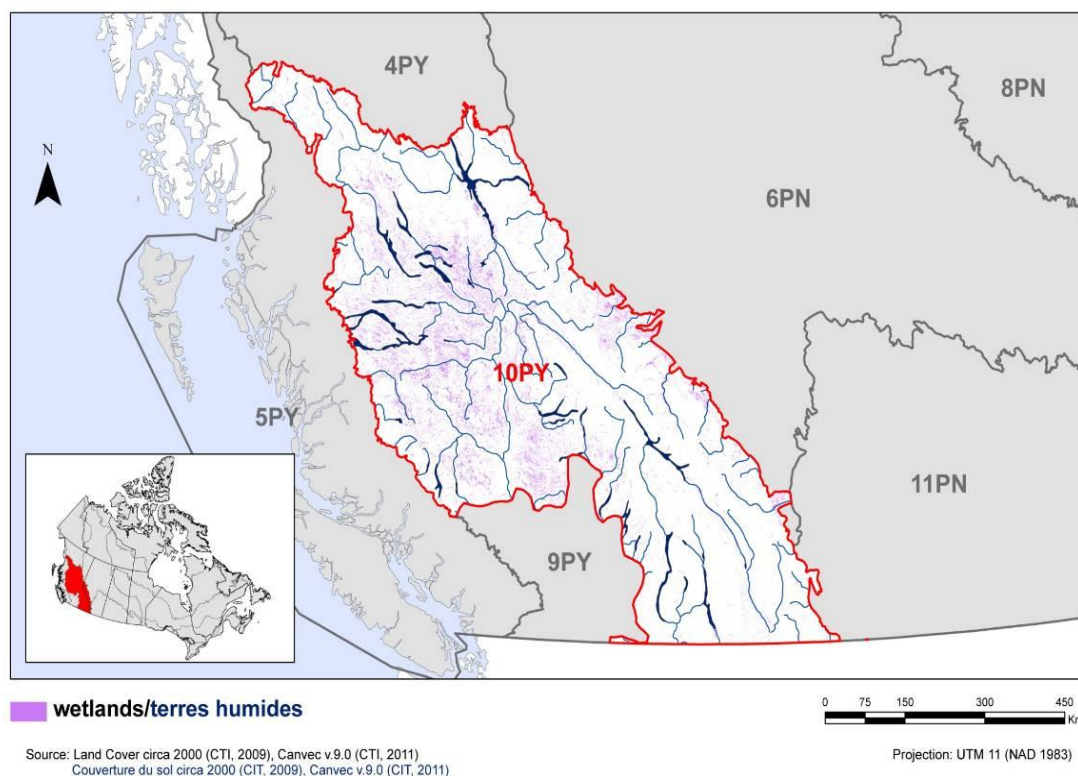
**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* refers to the removal/destruction of nests, *7.3 Other ecosystem modifications* refers to the loss of nesting sites, and *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

**Table 14. Threats addressed, conservation objectives, recommended actions, and priority species affected for urban habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Removal of nests by landowners.  Loss of nesting sites (building modification, building removal).	5.1 Hunting & collecting terrestrial animals  7.3 Other ecosystem modifications	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	1.4 Maintain important habitat features on the landscape.  2.9 Reduce nest destruction.	Research is needed to quantify the distribution and intensity of nest removal and assess the threat this behaviour poses to Barn Swallow populations.  Increase public awareness of the species, its benefits, and current legal protection to increase stewardship and eliminate destruction of nests.  Encourage landowners to incorporate nesting ledges on out-buildings in habitat suitable for Barn Swallows.	4.3 Awareness and communications  8.1 Research	Barn Swallow
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate species.  If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Barn Swallow

## Wetland

The wetland habitat class includes bogs, swamps, marshes, fens, and shallow open water (largely unvegetated surface, but <2m deep). Together, these areas cover about 2.4% of BCR 10 (CIJV 2009; Fig. 19). Although wetlands cover a relatively small area, they represent a very important habitat for birds, with 20 priority species using these habitats (Table 15). Wetlands are the only habitat class in BCR 10 to be utilized by priority species from all bird groups: landbirds (4 species), waterbirds (5), waterfowl (8), and shorebirds (2).



**Figure 19. Map of wetland habitat in BCR 10 Pacific and Yukon Region.**

Species that are found in wetland habitats face a wide variety of threats. Wetland habitats have been lost in the past to drainage and conversion to agriculture, and these losses continue, though at a lower rate today than historically (CIJV Technical Committee 2010). Currently, heavy livestock grazing can remove riparian and wetland vegetation, and along with agricultural runoff, degrade water quality (Fig. 20). Water diversion for irrigation or other uses and flood control measures impair wetland hydrology, and productive wetlands have been lost to reservoir creation. In addition, wetlands are highly vulnerable to climate change. Changes in precipitation and increased temperatures are expected to lower water levels and small or shallow wetlands (which are some of the most productive) may be lost completely. Biological, chemical and thermal characteristics of wetlands are also expected to change (e.g., become ice-free earlier, warmer, and eutrophic due to increases in primary productivity [CIJV Technical Committee 2010]; see the [Widespread Issues](#) section for more information on effects of climate

change in BCR 10 and objectives associated with climate change). Key actions to address threats facing priority species in wetland habitats include supporting efforts to reduce and mitigate the effects of climate change, protection of key wetland habitats, maintenance or restoration of natural hydrologic regimes, and increasing the use of beneficial management practices for biodiversity and bird conservation in ranching and agriculture, including establishment and maintenance of suitable vegetated buffers to maintain water quality (Table 16).

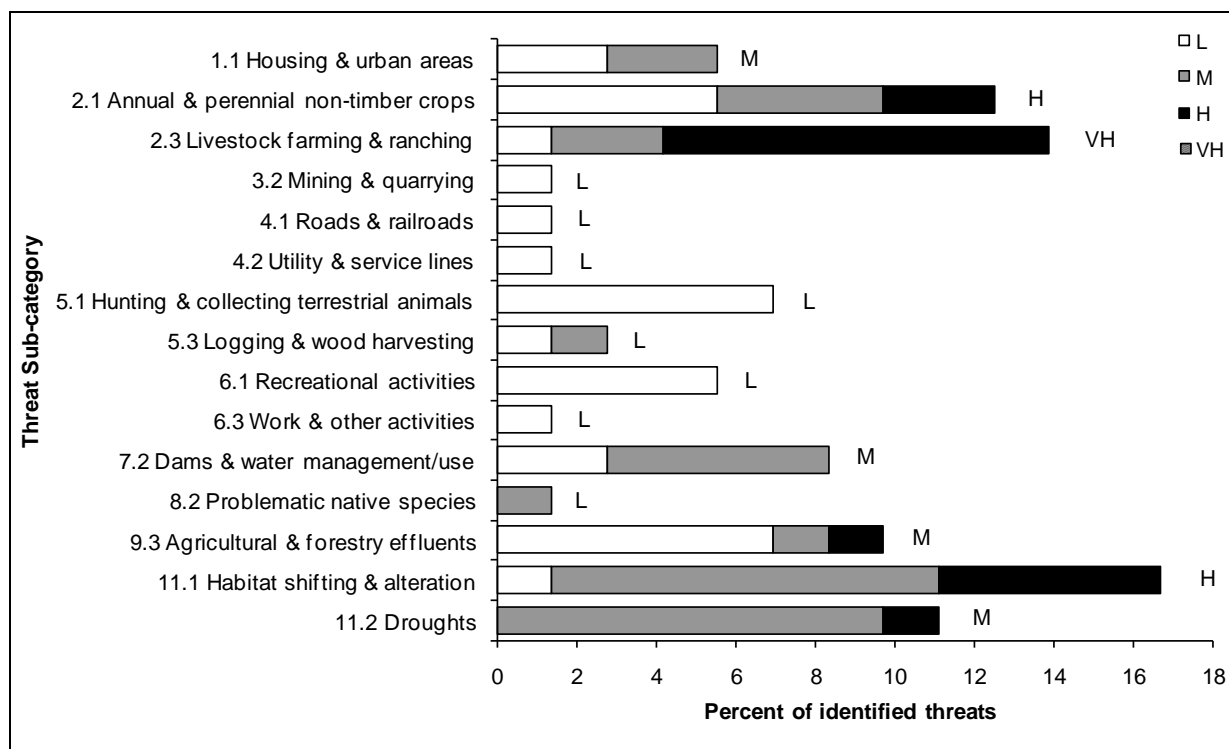


Table 15. Priority species that use wetlands, regional habitat class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
American Avocet	marsh		Assess / Maintain	Y			
American Bittern	marsh		Increase 100%	Y			
American Wigeon	marsh		Maintain current				Y
Black Tern	marsh		Assess / Maintain		Y	Y	
Cinnamon Teal	marsh		Maintain current				Y
Forster's Tern	marsh		Assess / Maintain	Y			
Great Blue Heron	marsh	veteran trees, cottonwood riparian	Assess / Maintain	Y			
Hooded Merganser	marsh	cavities	Maintain current				Y <sup>1</sup>
Horned Grebe	marsh		Increase 50%	Y			
Lesser Scaup	marsh		Maintain current				Y
Mallard	marsh		Maintain current				Y
Northern Harrier	marsh		Increase 50%		Y		
Peregrine Falcon ( <i>anatum</i> )	marsh	cliffs/canyons, outcrops/bluffs	Increase 50%	Y			
Ring-necked Duck	marsh		Maintain current				Y
Rusty Blackbird	marsh, bog, fen, swamp	forested wetlands, bogs, openings	Increase 100%	Y	Y		
Short-eared Owl	marsh		Increase 50%	Y	Y		
Trumpeter Swan	marsh		Maintain current	Y			Y
White-winged Scoter	marsh		Maintain current				Y
Wilson's Phalarope	marsh		Assess / Maintain		Y		

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

<sup>1</sup>The Hooded Merganser has a NAWMP rank of Moderate, but was included on the basis of expert opinion.



**Figure 20. Percent of identified threats to priority species in wetlands in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in wetland habitat (for example, if 100 threats were identified in total for all priority species in wetland habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in wetland habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *6.1 Recreation activities* and *6.3 Work & other activities* refer to disturbance of breeding birds due to human activity. *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

Table 16. Threats addressed, conservation objectives, recommended actions, and priority species affected for wetlands in BCR 10 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Wetland loss due to urban development or agricultural conversion.	1.1 Housing & urban areas 2.1 Annual & perennial non-timber crops	Maintain the quantity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Secure and manage wetlands for priority birds through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.  Protect and maintain a diversity of wetland habitats on the landscape, including small and seasonal wetlands.  Retain wetlands of all sizes.	1.1 Site/area protection 1.2 Resource and habitat protection	American Bittern American Wigeon, Black Tern, Horned Grebe, Mallard, Northern Harrier, Peregrine Falcon ( <i>anatum</i> ), Short-eared Owl, Trumpeter Swan, Wilson's Phalarope
Loss of habitat to creation of hydroelectric reservoirs.	7.2 Dams & water management/use	Maintain the quantity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Research is needed to determine if wetlands created under mitigation programs are suitable for Rusty Blackbirds.	8.1 Research	Rusty Blackbird
Degradation of wetland habitats due to livestock activity.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Maintain/restore suitable vegetated riparian buffers around wetlands to reduce erosion and avoid siltation.  Manage livestock distribution to prevent cattle from lingering in riparian areas. Control livestock access to surface water by using offsite water sources or fencing with controlled access points.	5.3 Private sector standards and codes	American Avocet, American Wigeon, Cinnamon Teal, Hooded Merganser, Lesser Scaup, Mallard, Ring-necked Duck, Trumpeter Swan, White-winged Scoter

Table 16 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Eutrophication of wetlands.	9.3 Agricultural & forestry effluents	Maintain and enhance the quality and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.5 Reduce habitat degradation from contaminants	Maintain unfertilized buffer areas around wetlands and riparian areas.  Manage runoff to avoid contamination of surface water by silage, manure or fertilizer.  Use pesticide and nutrient application practices that reduce the risk of direct drift into water courses or contamination of runoff that enters aquatic habitats.	2.1 Site/area management 5.3 Private sector standards and codes	American Bittern, Black Tern, Horned Grebe
Changes in water quality and runoff due to deforestation.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Maintain/restore suitable vegetated riparian buffers around wetlands to filter runoff and avoid siltation.  Increase retention around key wetland habitats, and log in stages to desynchronize increases in runoff.	5.3 Private sector standards and codes	American Avocet
Degradation of wetland habitats due to altered hydrological cycles and water level controls.  Wetland loss due to water diversion for urban, industrial, or agricultural use.	7.2 Dams & water management/use	Maintain natural hydrologic regimes.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Manage wetlands to maintain natural hydrological connectivity and hydrological cycles. Wherever possible, allow seasonal flooding to occur to maintain flood-dependent habitat.  Ensure that water diversion does not lead to lowering the water table or wetland loss. Ensure that quality of wetland habitats is maintained.	1.2 Resource and habitat protection 2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	American Avocet, Cinnamon Teal, Franklin's Gull, Lesser Scaup, Trumpeter Swan

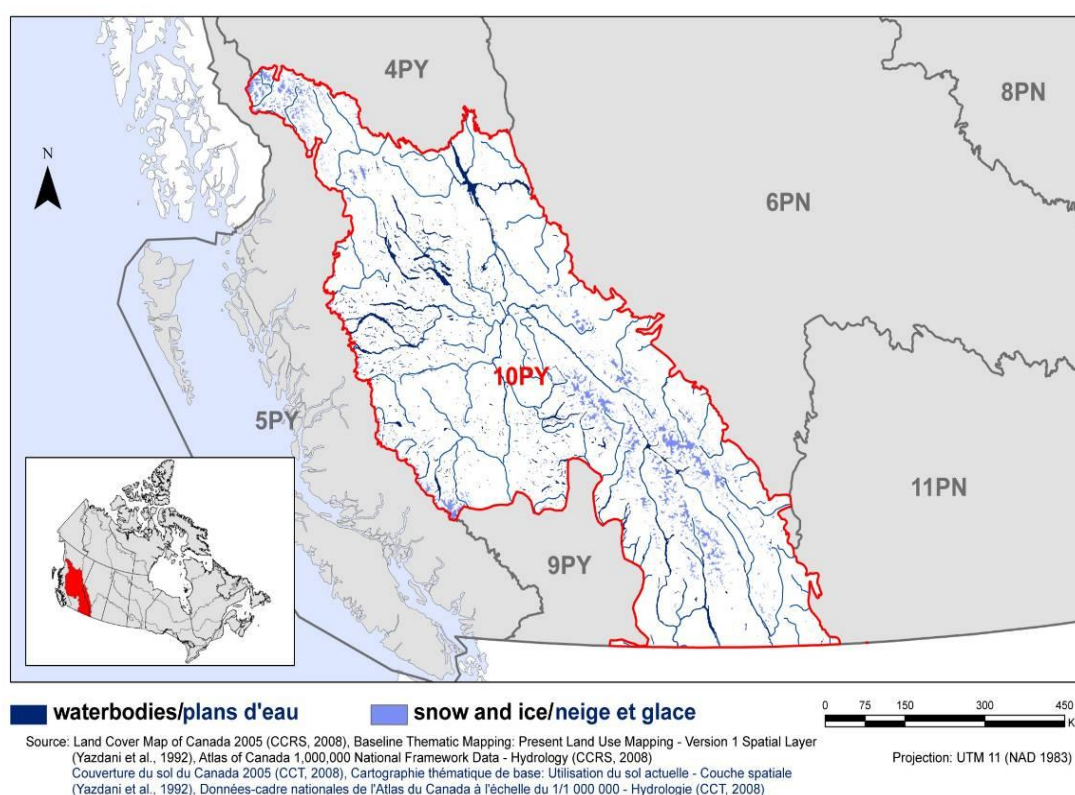
Table 16 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected
Abandonment of foraging areas, increased reproductive failure and/or colony abandonment due to human disturbance.  Destruction of low-lying nests by boat wakes.	6.1 Recreational activities	Avoid human disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	Use a combination of buffer zones and seasonal closures to prevent disturbance of nesting and foraging priority waterfowl and waterbirds.  Limit watercraft speeds and establish no-wake zones around nesting colonies of priority bird species.  Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.	1.1 Site/area protection 4.3 Awareness and communications	Black Tern, Lesser Scaup, Trumpeter Swan
Forestry practices encourage spread of Red-winged Blackbird into Rusty Blackbird habitat.	8.2 Problematic native species	Ensure that competition is not limiting Rusty Blackbird populations.	3.2 Reduce competition with problematic native species.	Research is required to determine if competition with Red-winged Blackbirds is limiting Rusty Blackbird populations and identify possible mitigation measures.  While waiting for research results, maintain unharvested buffers of contiguous forest around bogs used by breeding Rusty Blackbird.	2.1 Site/area management 8.1 Research	Rusty Blackbird

## Waterbodies, Snow and Ice

The waterbodies, snow and ice habitat class includes standing and flowing water such as reservoirs, lakes, ponds, rivers and streams, as well as areas where snow and/or ice covers the ground for the majority of the year. However, permanent snow and ice are not considered bird habitat *per se* in BCR 10, so the following discussion focuses on reservoirs, lakes, ponds, streams and rivers.

Waterbodies cover 3.6% of BCR 10 (CIJV 2009; Fig. 21). The 18 priority species that use these habitats are primarily waterbirds (7 species) and waterfowl (8), though landbirds (3) were also identified as using this habitat type (Table 17).



**Figure 21. Map of waterbodies, snow and ice habitat in BCR 10 Pacific and Yukon Region.**

Priority species in these habitats face a number of threats (Fig. 22), including climate change. Altered precipitation patterns are expected to cause earlier and more intense spring floods, while reducing summer and fall flows (CIJV Technical Committee 2010; see the [Widespread Issues](#) section for further discussion on effects of climate change in BCR 10 and objectives associated with climate change). Changes to water levels and hydrology patterns, whether due to climate change, water management (e.g., dams, flood control measures, human water use), or large-scale forestry, threaten priority species by altering the quality and availability of foraging and nesting habitat. Priority species are also threatened by decreases in water quality due to agricultural and industrial runoff and overgrazing in riparian areas. Many priority

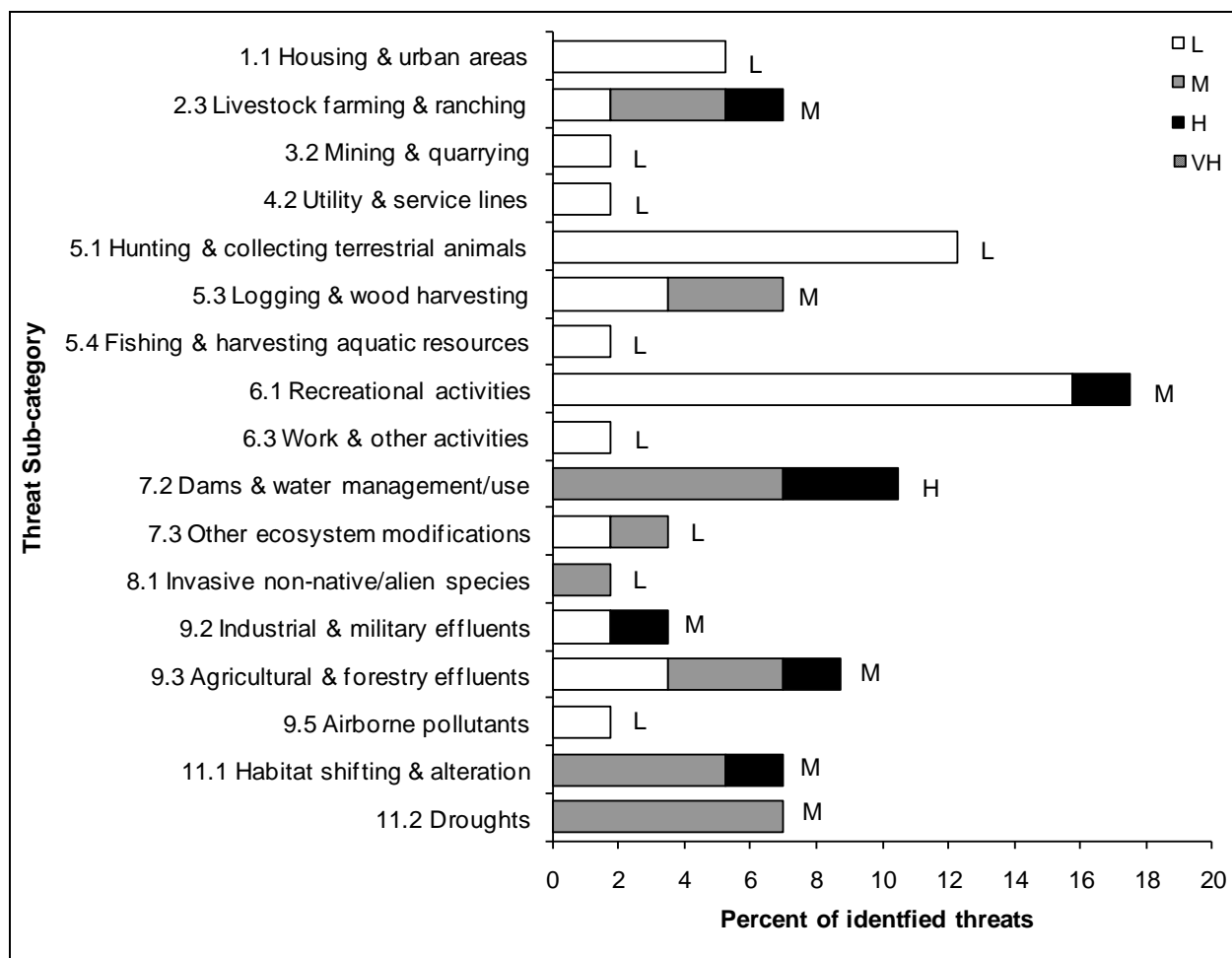
species, particularly colonial breeders, are also sensitive to human disturbance while breeding. Key actions to address threats facing priority species in this habitat type include protecting water quality, maintaining or restoring natural hydrological cycles, and supporting efforts to reduce and mitigate the effects of climate change. Increasing public awareness of the needs of breeding priority waterbirds and waterfowl to minimize disturbance is also important (Table 18).

**Table 17. Priority species that use waterbodies, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat feature	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
American Avocet	lake, pond		Assess / Maintain	Y			
American Dipper	Stream		Assess / Maintain			Y	
American White Pelican	Lake	islands	Assess / Maintain	Y		Y	
American Wigeon	lake, river, pond		Maintain current				Y
Barrow's Goldeneye	lake, pond	cavities	Maintain current				Y
Black Swift	river, stream	waterfalls, cliffs/canyons	Increase 50%		Y		
Bufflehead	lake, pond	cavities	Maintain current				Y
California Gull	lake, river		Assess / Maintain	Y		Y	
Canada Goose	lake, river, pond		Maintain current				Y
Common Loon	Lake		Assess / Maintain			Y	
Double-crested Cormorant	Lake	cliffs, islands	Assess / Maintain	Y			
Harlequin Duck	stream, river	cavities	Maintain current	Y			Y
Horned Grebe	Lake		Increase 50%	Y			
Lesser Scaup	lake, pond		Maintain current				Y
Mallard	lake, pond, stream		Maintain current				Y
Peregrine Falcon ( <i>anatum</i> )	river, lake	cliffs/canyons, outcrops/bluffs	Increase 50%	Y			
Trumpeter Swan	lake, river		Maintain current	Y			Y
Western Grebe	marsh		Increase 50%	Y		Y	

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.





**Figure 22. Percent of identified threats to priority species in waterbodies in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in waterbodies (for example, if 100 threats were identified in total for all priority species in waterbodies, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in waterbodies is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* and *5.4 Fishing and harvesting of aquatic resources* refers primarily to lead poisoning due to ingestion of lead shot, sinkers, and jigs. *6.1 Recreational activities* and *6.3 Work & other activities* refers to disturbance of breeding birds due to human activity. *9.3 Agricultural and forestry effluents* refers to stream siltation and effects of pesticide use.

**Table 18. Threats addressed, conservation objectives, recommended actions, and priority species affected for waterbodies in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Degradation of riparian areas and decreases in water quality due to livestock activity.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of lake, pond, stream and river habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Manage livestock distribution to prevent overuse of riparian areas. Restore and enhance degraded habitat through fencing and livestock management.  Control livestock access to surface water by using offsite water sources or fencing with controlled access points.	5.3 Private sector standards and codes	American Avocet, American White Pelican, Bufflehead, Lesser Scaup
Alterations to water quality due to industrial activities such as mining, logging and agriculture.	3.2 Mining & quarrying 5.3 Logging & wood harvesting 9.3 Agricultural & forestry effluents	Maintain and enhance the quality and diversity of lake, pond, stream and river habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Establish and maintain vegetated buffer areas around waterbodies and along watercourses to filter sediment, excessive nutrients, and other contaminants from surface runoff.  Manage the timing and location of activities (road/trail construction, felling, etc.) to minimize sediment runoff into surface waters, and use erosion control measures. Follow beneficial management practices for instream works.	5.3 Private sector standards and codes	American Dipper, American White Pelican, Harlequin Duck
Eutrophication of ponds and lakes.	9.3 Agricultural & forestry effluents	Maintain and enhance the quality and diversity of lake, pond, stream and river habitats.	1.5 Reduce habitat degradation from contaminants	Maintain unfertilized buffer areas around wetlands and riparian areas.  Manage runoff to avoid contamination of surface water by silage, manure or fertilizer.  Use pesticide and nutrient application practices that reduce the risk of direct drift into water courses or contamination of runoff that enters aquatic habitats.	2.1 Site/area management 5.3 Private sector standards and codes	Horned Grebe

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 18 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Degradation or loss of lake and pond habitats due to urban shoreline development.	1.1 Housing & urban areas	Maintain and enhance the quality and diversity of lake, pond, stream and river habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Retain natural emergent/shoreline vegetation and undeveloped riparian buffers to provide habitat for priority species. Minimize shoreline access points. Avoid development on islands used by breeding waterfowl and waterbirds or near priority waterbird colonies.	1.1 Site/area protection 5.3 Private sector standards and codes	Canada Goose, Common Loon, Western Grebe
Alterations to stream flow due to hydroelectric development and mountain pine beetle infestation and salvage logging.	7.2 Dams & water management/use 7.3 Other ecosystem modifications	Maintain natural hydrologic regimes.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.  1.3 Ensure the continuation of natural processes that maintain bird habitat.	Wherever possible, maintain natural hydrology on watercourses. On controlled streams, mimic historical hydrological regimes as closely as possible. At a minimum, maintain recommended in-stream flow thresholds.  Increase retention in areas attacked by mountain pine beetle, particularly areas with live trees and/or understory. Retain downed woody debris and do not harvest in riparian areas. Salvage log in stages to desynchronize increases in runoff.	1.2 Resource and habitat protection 5.3 Private sector standards and codes	American Dipper, Harlequin Duck
Altered hydrologic regimes due to large-scale timber harvest or hydroelectric development reduce the suitability of waterfall nesting sites.	5.3 Logging & wood harvesting 7.2 Dams & water management/use	Maintain natural hydrologic regimes.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Conduct inventories of Black Swift nest sites in BCR 10. Develop and implement monitoring programs to determine population trends.  Locate hydroelectric developments to minimize reduction of flow at waterfalls. Manage timber harvest to ensure that natural hydrological cycles are maintained at known Black Swift nest sites.  Initiate research to determine the impacts of altered stream flow on nesting density and success of Black Swift.	5.3 Private sector standards and codes 8.1 Research 8.2 Monitoring	Black Swift
Human disturbance at nesting colonies can cause reproductive	6.1 Recreational activities	Avoid human disturbance of nesting priority species.	4.1 Reduce disturbance from human recreation.	Establish undisturbed buffer zones (minimum 100m) around breeding colonies of priority bird species to prevent behavioural disruption. Institute seasonal closures if necessary.	1.1 Site/area protection 5.4 Compliance and enforce-	American White Pelican, California Gull, Double-crested Cormorant,

Table 18 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
failure and nest/colony abandonment.				Maintain current restrictions on access and activities at White Pelican Provincial Park (Stum Lake).	ment	Western Grebe
Human disturbance can cause individuals to abandon high-quality habitat, reduce reproductive success and/or cause complete reproductive failure.	6.1 Recreational activities	Avoid human disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	<p>Establish buffer zones around important feeding, roosting, nesting and brood-rearing areas for priority waterfowl and waterbirds species.</p> <p>Reduce or avoid activities such as rafting, boating or fishing on stream reaches used by breeding Harlequin Ducks, particularly narrower streams.</p> <p>Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p>	<p>1.1 Site/area protection</p> <p>4.3 Awareness and communications</p> <p>5.3 Private sector standards and codes</p>	Barrow's Goldeneye, Common Loon, Harlequin Duck, Lesser Scaup, Trumpeter Swan
<p>Changing water levels permit predator access to and/or destroy nests, colonies and loafing areas.</p> <p>Changing water levels alter availability of foraging and loafing areas.</p>	7.2 Dams & water management/use	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	2.9 Reduce nest destruction.	<p>Manage water levels in ponds and lakes used by priority species to maintain and protect the suitability of nesting, foraging and loafing habitat. If necessary, anti-predator fencing may be used as an emergency measure if low water levels permit terrestrial predators (particularly coyotes) access to the American Pelican nesting colony at Stum Lake.</p> <p>On reservoirs where changing water levels threaten nests, provide artificial nesting platforms for Common Loons. Avoid drawdowns in reservoirs used by breeding Western Grebes during the breeding season.</p>	<p>1.2 Resource and habitat protection</p> <p>2.1 Site/area management</p> <p>3.2 Species recovery</p> <p>5.3 Private sector standards and codes</p>	American White Pelican, Common Loon, Western Grebe
Invasive species (e.g., water milfoil) alter habitat structure and suitability.	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing further introductions.	3.5 Prevent and control the spread of invasive and exotic species.	<p>Eliminate or control non-native weeds through mechanical control, biological control, or herbicides (as a last resort).</p> <p>Increase public awareness of invasive plant species and measures to control their spread (such as regular cleaning of boats, vehicles and equipment, and using only native species for gardening, landscaping and re-vegetation purposes), to prevent establishment of additional invasive species.</p>	<p>2.2 Invasive/problematic species control</p> <p>4.3 Awareness and communications</p>	Western Grebe

## ***Riparian***

Riparian areas occur adjacent to standing or flowing water where the vegetation is influenced by the presence of water and is distinct from adjacent uplands. Riparian areas may be treed, shrubby, or herbaceous, depending on site conditions. While there are no available estimates of the total area of riparian habitats in BCR 10, riparian areas are geographically restricted and form only a small part of the overall landscape (there is no available map of riparian habitat). Despite their small representation, riparian areas are important in terms of biodiversity. Riparian areas are typically used as breeding, wintering, and stopover habitat by many species. They also serve as corridors connecting habitats and facilitating wildlife movement. Of the 12 priority species that are found in riparian habitats in BCR 10, 8 are landbirds and 4 are waterfowl (Table 19).

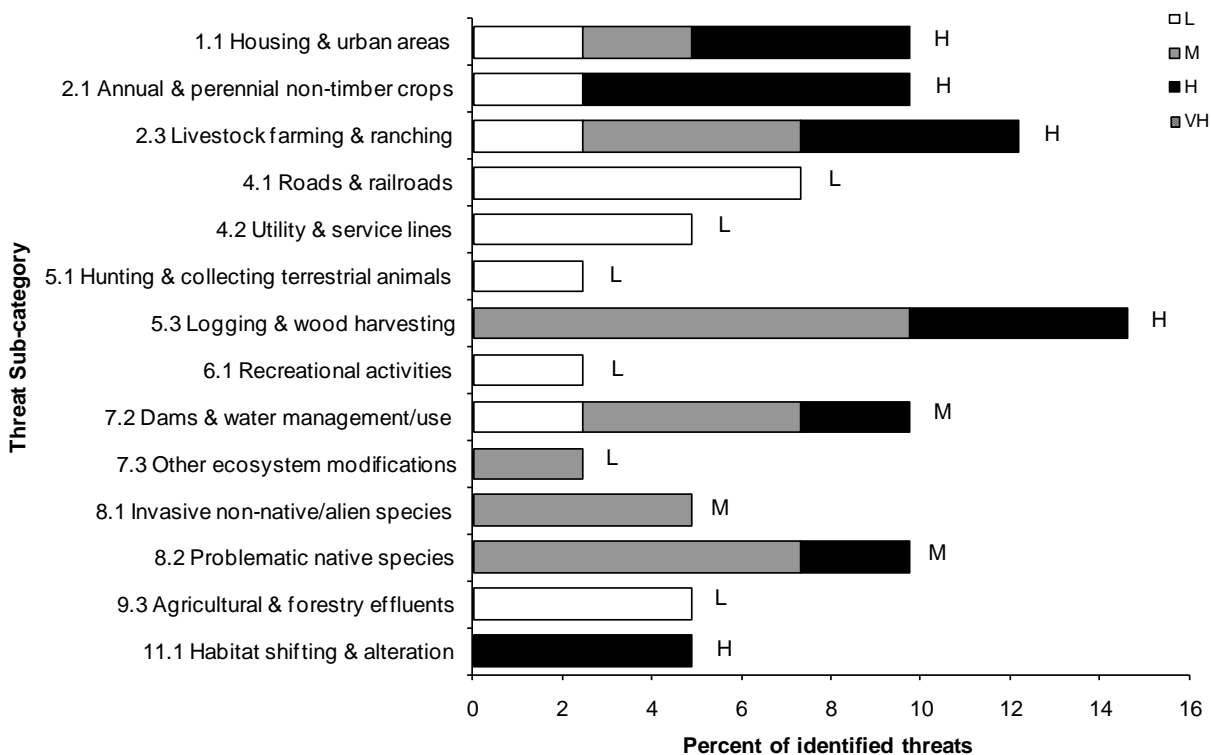
Riparian areas, and consequently the priority birds that use them, face a wide variety of threats due to their location on flatter and more accessible valley bottoms, proximity to water, and soil characteristics. Riparian areas have been and continue to be threatened by urban and agricultural development (Fig. 23). Altered hydrologic regimes and loss of natural flooding due to water control measures can also lead to degradation or loss of riparian habitat. Cattle grazing can alter vegetation structure. In addition, the ongoing mountain pine beetle outbreak in British Columbia and associated salvage logging activities have the potential to impact priority bird species in riparian areas by both loss of trees and changes to watershed hydrology (see the section on Mountain Pine Beetle for a more detailed discussion). Key conservation actions to support priority birds in riparian habitats include protection of important riparian areas, management of timber harvest and mountain pine beetle-associated activities for biodiversity conservation, maintenance or restoration of natural hydrologic regimes, and management of grazing pressure to avoid degradation of riparian habitats (Table 20).

**Table 19. Priority species that use riparian habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Barrow's Goldeneye	Forest	cavities	Maintain current				Y
Bufflehead	Forest	cavities	Maintain current				Y
Calliope Hummingbird	shrub, forest	openings/clearings	Assess / Maintain		Y	Y	
Harlequin Duck	shrub, forest	cavities	Maintain current	Y			Y
Hooded Merganser	Forest	cavities	Maintain current				Y <sup>1</sup>
Lazuli Bunting	Shrub	aspen groves, cottonwood riparian, recent burns, wet draws in shrubsteppe	Maintain current			Y	
Lewis's Woodpecker	Forest	snags, recent burns, openings/clearings, low stem density, cottonwood	Increase 50%	Y	Y		
Rufous Hummingbird	shrub, forest	openings/clearings	Assess / Maintain		Y	Y	
Western Screech-Owl ( <i>macfarlanei</i> )	Forest	cavities, cottonwood riparian	Recovery objective	Y			
Willow Flycatcher	Shrub	openings/clearings	Assess / Maintain		Y	Y	
Yellow Warbler	Shrub		Increase 100%		Y		
Yellow-breasted Chat	Shrub	dense shrub thickets	Recovery objective	Y			

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

<sup>1</sup> Hooded Merganser has a NAWMP rating of Moderate in WCR 10 but was added to the priority species list on the basis of expert opinion.



**Figure 23. Percent of identified threats to priority species in riparian habitat in each IUCN threat sub-category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in riparian habitat (for example, if 100 threats were identified in total for all priority species in riparian habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in riparian habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *7.3 Other ecosystem modifications* refers to changes in forest structure due to the Mountain Pine Beetle outbreak. *8.1 Invasive non-native/alien species* refers to predation by domestic cats and competition from European Starling. *8.2 Problematic native species* refers to Brown-headed Cowbird parasitism. *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

**Table 20. Threats addressed, conservation objectives, recommended actions, and priority species affected for riparian habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Loss of riparian habitat and important habitat features to urban development, agricultural conversion or logging activity.	1.1 Housing & urban areas 2.1 Annual & perennial non-timber crops 5.3 Logging & wood harvesting	Maintain the quantity and quality of riparian habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.4 Maintain important habitat features on the landscape.	Secure and manage riparian habitat for priority species through creation of protected areas, land acquisition, stewardship agreements, and conservation covenants.  Maintain, restore, and where possible, expand existing riparian buffers in agricultural and developed areas. At a minimum, maintain natural riparian vegetation in buffer strips (>30m wide) on either side of the watercourse, with riparian and upland vegetation >300m wide for at least 10% of stream length.  Manage riparian forests to maintain key habitat features for priority species, particularly large veteran trees, snags and all cavity-bearing trees.	1.1 Site/area protection 2.1 Site/area management 5.3 Private sector standards and codes	Barrow's Goldeneye, Bufflehead, Harlequin Duck, Hooded Merganser, Lewis's Woodpecker, Western Screech-Owl ( <i>macfarlanei</i> ), Yellow-breasted Chat
Loss of riparian habitat due to altered hydrologic regimes.	7.2 Dams & water management/use	Maintain the quantity and quality of riparian habitats.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Maintain the natural range of variation in water flow, water levels and flood frequency in rivers, streams, and wetlands. Remove unneeded dams, dikes, or levees to re-establish hydrological connections between riparian and floodplain habitats. On controlled streams, mimic historical hydrological regimes as closely as possible.  Restore meanders to channelized streams.	2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Harlequin Duck, Hooded Merganser, Western Screech-Owl ( <i>macfarlanei</i> ), Willow Flycatcher
Degradation of riparian habitats due to livestock activity.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of riparian habitat.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Manage livestock distribution to prevent cattle lingering in and overusing riparian areas, by providing offsite water and placing feed, salt blocks and shelter away from riparian areas.  Use extra (or longer) rest periods on riparian areas in rotational grazing systems.  Where riparian areas have been degraded by livestock activity, restore and enhance habitat through fencing, livestock management, and planting native riparian	2.1 Site/area management 2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Lewis's Woodpecker, Western Screech-Owl ( <i>macfarlanei</i> ), Willow Flycatcher, Yellow Warbler, Yellow-breasted Chat

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

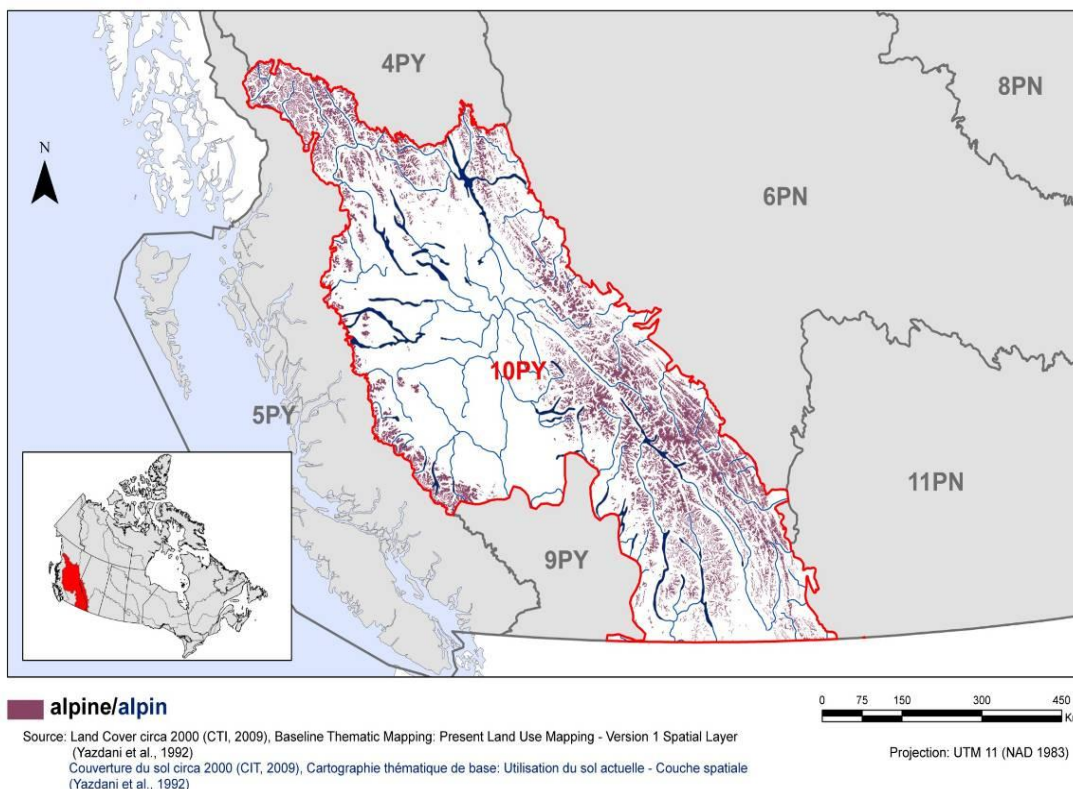


Table 20 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
				vegetation.		
Brown-headed Cowbird parasitism.	8.2 Problematic native species	Ensure that brood parasitism is not limiting priority species' populations.	3.3 Reduce parasitism/predation.	<p>Minimize fragmentation of riparian habitats.</p> <p>Maximize the distance between feedlots, livestock staging areas, and other cowbird attractants and riparian areas.</p> <p>Avoid grazing in riparian areas during the breeding season.</p>	<p>2.2 Invasive/problematic species control</p> <p>5.3 Private sector standards and codes</p>	Lazuli Bunting, Willow Flycatcher, Yellow Warbler, Yellow-breasted Chat
Habitat suitability decreases over time due to vegetative succession.	7.3 Other ecosystem modifications	Maintain sufficient suitable habitat for Yellow-breasted Chat.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	<p>Continue to secure, restore and enhance additional habitat for Yellow-breasted Chat through land acquisition, stewardship agreements and conservation covenants.</p> <p>Maintain and protect a large network of lowland riparian sites to ensure adequate representation of seral stages required by Yellow-breasted Chat.</p>	1.1 Site/area protection	Yellow-breasted Chat
Competition from European Starlings limits availability of nesting cavities.	8.1 Invasive non-native/alien species	Ensure that nest site competition is not limiting Lewis's Woodpecker populations.	3.1 Reduce competition with invasive species.	<p>Research is required to understand under what conditions and the extent to which nest-site competition with European Starlings may be limiting Lewis's Woodpecker populations.</p> <p>In the interim, retain cavity-bearing trees and snags as nesting habitat. Initiate nest-box programs in areas lacking cavity-bearing trees and snags.</p>	<p>1.2 Resource and habitat protection</p> <p>3.2 Species recovery</p> <p>8.1 Research</p>	Lewis's Woodpecker

## Alpine

Alpine habitats occur at the highest elevations of the Rocky and Coast Mountains in BCR 10 (Fig. 24). Areas classified as alpine begin at about 2,250m elevation in the southeast and at somewhat lower elevations to the north and west. Most vegetation within alpine areas consists of dwarf shrubs, grasses, forbs and lichens. Trees typically exist only as stunted forms at the lowest elevations of the alpine zone (B.C. Ministry of Forests 1998). Alpine areas are the second most extensive habitat class after coniferous forest, covering about 10% of BCR 10 (CIJV 2009).



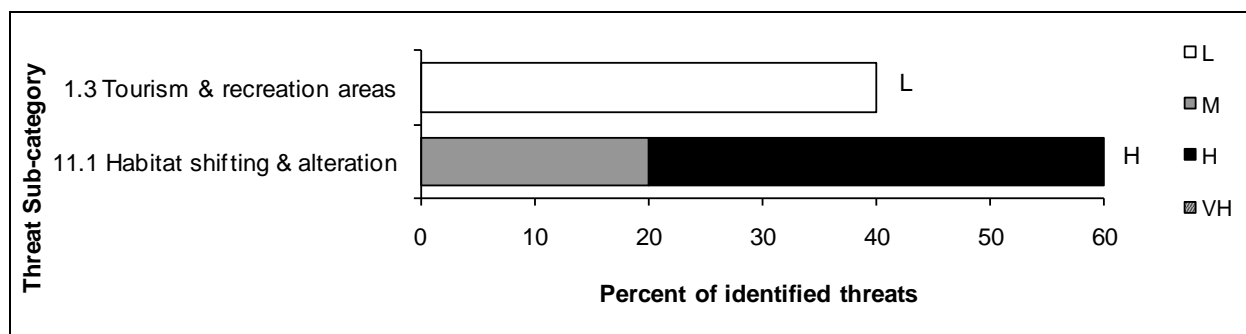
**Figure 24. Map of alpine habitat in BCR 10 Pacific and Yukon Region.**

Alpine areas provide both breeding and migration habitat to a number of bird species, and are relatively intact and undisturbed compared to other habitats in BCR 10. The three priority landbird species identified within this habitat (Table 21) nonetheless face threats from loss of habitat to high-elevation development. The largest threat facing this habitat, however, is climate change (Fig. 25). Climate change is expected to shift habitats northward and to higher elevations, leading to net loss of alpine habitats. Actions to address these threats include locating alpine developments away from key habitat areas for priority species and supporting efforts to reduce and mitigate the effects of climate change (Table 22). See the [Widespread Issues](#) section for more information on the effects of climate change in BCR 10 and objectives associated with climate change.

**Table 21. Priority species that use alpine habitat, regional habitat class, important habitat features, population objectives and reason for priority status.**

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Brewer's Sparrow ( <i>taverneri</i> )	alpine/subalpine meadows	shrub thickets	Assess / Maintain		Y		
Horned Lark	subalpine, alpine		Increase 50%	Y			
White-tailed Ptarmigan	tundra, rock/ice	snow fields	Assess / Maintain			Y	

**Note:** Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or provincially (AB), or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.



**Figure 25. Percent of identified threats to priority species in alpine habitat in each IUCN threat category by magnitude.**

Each bar represents the percent of the total number of threats identified in each sub-threat category in alpine habitat (for example, if 100 threats were identified in total for all priority species in alpine habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in alpine habitat is shown at the end of each bar (also presented in Table 4).

**Note:** The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions.

**Table 22. Threats addressed, conservation objectives, recommended actions, and priority species affected for alpine habitat in BCR 10 Pacific and Yukon Region.**

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected <sup>†</sup>
Loss of alpine habitat to development (e.g., ski hills).	1.3 Tourism & recreation areas	Maintain the quantity and quality of alpine habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Conduct bird surveys at potential developments prior to construction to identify key habitat areas for priority species. Locate developments where they will have the least detrimental effect on priority birds.	2.1 Site/area management	Brewer's Sparrow ( <i>taverneri</i> ), White-tailed Ptarmigan

<sup>†</sup> Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

## Section 3: Additional Issues

### ***Widespread Issues***

Some well known conservation issues may not be identified in the literature as significant threats to populations of an individual priority species and therefore may not be captured in the threat assessment. However, these issues, while they may or may not be limiting factors for any individual species or population, contribute to avian mortality or decreases in fecundity across many species and thus warrant conservation attention. Usually these issues transcend habitat types and are considered “widespread”. Examples of these issues include:

- Collisions with man-made structures (buildings, cars, utility/telecommunications towers and lines, etc.)
- Predation by domestic cats
- Pollution/pesticides/oil spills
- Climate change

Because the widespread issues do not fit into the standard presentation format used in the BCR strategies, they are presented separately here. The mortality estimates included here are largely based on draft reports that were available within Environment Canada when this strategy was produced; the numbers may change as the final scientific papers are peer-reviewed and published.

### **Collisions**

#### ***Buildings***

Collisions with glass windows or reflective panels on buildings, is believed to be a significant source of bird mortality in Canada. Estimates of mortality from collisions with houses in Canada (including birds using feeders) range from approximately 15.8–30.5 million birds per year (Machtans et al. 2013). Mortality from collisions with buildings of fewer than 12 storeys is estimated at approximately 0.3–11.4 million birds/year, and for all cities in Canada with tall buildings in an urban core the estimate is 13,000–256,000 birds/year (Machtans et al. 2013). The total estimate of mortality from collisions with buildings in Canada is therefore between 16.1–42.2 million birds/year (Machtans et al. 2013).

Data from Canada and the northeastern United States reveal that 163 species of birds of 32 families are known to have been killed by buildings. Some families and species of birds are disproportionately affected by collisions with buildings. *Parulidae* (warblers), *Fringillidae* (sparrows and allies), and *Regulidae* (kinglets) account for 70% of all bird deaths; the species most frequently killed are White-throated Sparrows (13.5% of all reported deaths), Golden-crowned Kinglets (10.2%), Dark-eyed Juncos (6.1%), Ovenbirds (5.3%) and Ruby-crowned Kinglets (5.3%). The population-level effects of bird mortality from building strikes are unknown. See Table 23 for conservation objectives and actions.

### *Wind Turbines*

The 2,955 wind turbines in Canada in 2011 have drawn considerable attention for their potential to cause mortality to birds and other species (notably bats). Two sources of mortality are typically associated with wind turbines: collisions with the turbines themselves, and the destruction of nests by turbine construction activities during the breeding season. On average, 5.9 birds are killed per turbine per year. Scaling up to a national level, an estimated 16,700 birds (range 13,300–21,600) die from collisions with wind turbines each year (Zimmerling et al. 2013).

Some species are particularly vulnerable to collisions with wind turbines, for example, raptors flying along a land/water interface. For smaller, more common passerine species (warblers, thrushes, kinglets, etc.), the relatively small number of birds affected does not appear to pose a population level threat. However, the anticipated proliferation of wind turbines means we should continue to ensure that turbines are sited to avoid important bird habitats and migration corridors.

At the 43 wind farms in Canada for which data are available, total habitat loss per turbine is 1.23 ha on average. Based on this average, the predicted total habitat loss for wind farms nationwide is 3,635 ha. Using published estimates of nest densities, the total number of affected nests, not accounting for construction that might occur outside the breeding season, is approximately 5,700 (Zimmerling et al. 2013). See Table 23 for conservation objectives and actions.

### *Communication Towers*

There are currently almost 8,000 communication towers in Canada >60m high (Longcore et al. 2012), each of which can pose a hazard to birds during migration. Birds are attracted to the lights of communication towers and are killed when they collide with the structures and guy wires. Mortality increases exponentially with tower height, in part because the use of guy wires also increases with tower height. Poor weather also plays a significant role in increasing migrant fatality; foggy and cloudy conditions increase the lit area around towers and block celestial clues used by migrating birds. The result is that birds circle to exhaustion in the halo of artificial light, or collide with each other, the tower, or its guy wires (American Bird Conservancy 2012).

Avian mortality at towers is unequally distributed among species and regions, but estimates suggest that over 220,000 birds are killed in Canada each year. However, BCR 10 is estimated to contribute relatively little to the total avian collision mortality in Canada (Longcore et al. 2012).

Neotropical migrants in the families *Parulidae* (wood-warblers) and *Vireonidae* (vireos) are the species most commonly killed by communication towers. These families include threatened species and many that are of conservation concern in Canada and/or the United States. When considered in concert with mortality at towers in the United States (which is 20 times higher due to the larger number and greater height of towers in the United States), and the mortality from other stationary structures, mortality from collisions with communications towers may

negatively affect the population trends of some birds. See Table 23 for conservation objectives and actions.

### *Power Lines*

Birds may be killed by colliding with power lines, or they may be electrocuted. Species with high wing-loading and thus low maneuverability, such as waterfowl, appear particularly at risk for collisions (Bevanger 1998). Electrocutions are most likely for large birds such as raptors and herons, whose bodies are large enough to span the distances between wires and create a short circuit. Raptors' habit of using power poles as perches further increases their risk. However, estimates of total mortality due to collisions and electrocutions can vary widely (Manville 2005) and population-level impacts are difficult to determine. Canadian estimates are that 161,000 – 802,000 birds are killed annually by electrocution and another 5.3 – 20.6 million birds are killed each year by colliding with electrical transmission lines (Calvert et al. 2013). See Table 23 for conservation objectives and actions.

### *Fences*

Birds can be killed by colliding with and/or becoming entangled in barbed-wire fences. Large, low-flying birds are particularly vulnerable, though a wide range of waterbirds, waterfowl, raptors, passerines and game birds can be affected (Paige 2008, Allen and Ramirez 1990). While there are few quantitative data on the impacts of fence collisions, it can be a major source of mortality for some species (e.g., Lesser Prairie-Chicken; Wolfe et al. 2007). See Table 23 for conservation objectives and actions.

### *Vehicles*

There are over 1.4 million km of roads and hundreds of airports in Canada (World Bank Indicators 2012) that are often bordered by fences and vegetation that provide convenient places for birds to perch, forage, and nest. The paved surfaces can attract birds through the heat they emit, the puddles that form beside roads, and the salt and grit used for de-icing. Current estimates for one- and two-lane paved roads outside of major urban centres in Canada are that between 4.65 and 13.8 million birds are killed annually (Bishop and Brogan 2013).

Bird collisions with cars are influenced by the location of the road, proximity of vegetation, and vehicle speed. Raptors and owls that hunt and forage near roads are particularly vulnerable, but many species forage for grit and road salt or are otherwise attracted to roads have a high likelihood of being hit by vehicles. The population level effects of this source of mortality are not known. See Table 23 for conservation objectives and actions.

## **Predation by Domestic Cats**

Based on the number of pet cats in Canada and published kill rates by cats elsewhere, roughly 204 million birds (range 105–348 million) are killed by domestic and feral cats in Canada each year (Blancher 2013). The broad range on this estimate reflects imprecise information on the average number of bird kills per cat, especially for rural and feral cats, and a lack of information on the number of feral cats (versus owned or pet cats) in Canada.



The birds most susceptible to cat predation are those that nest or forage on or near the ground, or spend substantial time in human-dominated landscapes (both rural and urban) where cats are abundant. The proportion of Canada's birds killed by cats would be higher if additional cat predation when migrating through, or wintering in, the U.S. is factored in.

Without detailed study of the individual species affected, it is difficult to assess whether mortality caused by cat predation impacts population trends of birds in Canada. Nevertheless, it is likely that many species of birds are potentially vulnerable to population effects at the local scale in southern Canada. See Table 23 for conservation objectives and actions.

## **Pollution**

Pollution caused by industrial chemicals, pesticides and heavy metals can have both direct and indirect effects on survival and reproduction in birds. Sometimes the effects of exposure to pollutants are unexpected and do not result in immediate, measurable impacts on bird populations (Eeva and Lehtikoinen 2000, Franceschini et al. 2008, North American Bird Conservation Initiative, U.S. Committee 2009, Mineau 2010). However, persistent exposure can result in sharp declines in bird populations as happened with Peregrine Falcons in eastern Canada prior to the ban of DDT.

### *Pesticides*

The most recent estimate suggests that 0.96-4.4 million birds are killed by pesticides annually in Canada (Mineau 2010). Provinces such as Saskatchewan, which have a large agricultural land base, account for the majority of the estimated kill, and pesticides are thought to be an important contributor to the decline in grassland bird species in Canada (Mineau 2010). Pesticides can kill birds rapidly following contact or may have sub-lethal impacts such as suppressed immune function and reduced stress response. There may also be indirect effects of pesticides such as reduction in prey and changes in vegetation that reduce habitat quality. While the use of the many toxic pesticides has been eliminated in Canada, migratory birds are still exposed while on wintering grounds in countries where their use is still permitted (Mineau 2010). See Table 23 for conservation objectives and actions.

### *Toxic Chemicals and Heavy Metals*

Toxic organic chemicals and heavy metals released into the environment can also negatively impact bird populations. While some industrial chemicals such as PCBs are regulated, there is concern about new chemicals such as flame retardants (PBDE) that are used in computers, car parts and upholstery and whose effects on wildlife are largely unknown (Environment Canada 2003). Scavengers experience toxic effects when they ingest lead shotgun pellets or bullet fragments embedded in carcasses of game animals, and loons and other waterbirds are exposed to lead from shotgun pellets, sinkers and jigs that they ingest either while collecting grit for their gizzards or by eating bait fish with line and sinker still attached (Scheuhammer and Norris 1996, Scheuhammer et al. 2003). In some areas lead poisoning from sinkers and jigs can account for approximately half of the mortality of adult Common Loons on their breeding grounds (Scheuhammer and Norris 1996). Birds are also susceptible to bioaccumulation of other toxic metals such as methylmercury, selenium, and others when they consume prey that has been exposed to these substances. See Table 23 for conservation objectives and actions.

Table 23. Conservation objectives and actions associated with bird mortality from collisions, cats and contaminants.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
<b>Collision mortality</b>						
Collisions with buildings cause bird mortality.	1.1 Housing and urban areas 1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with windows/buildings	2.7 Reduce incidental mortality from collisions	Follow beneficial management practices for bird-friendly buildings including using bird-friendly glass, reducing reflection from windows, providing visual markers to enable birds to perceive windows, and reducing light pollution.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with wind turbines cause bird mortality.	3.3 Renewable energy	Reduce incidental mortality from collisions with wind turbines	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing bird mortality when designing and locating wind turbines. Ensure that offshore wind energy developments will not present significant migration barriers. Locate offshore wind energy developments away from seabird breeding colonies and important waterbird foraging areas. Utilize techniques such as radar monitoring to determine pre-construction flight paths and assess the degree to which wind farms present migration barriers, and infrared camera systems to quantify strike rates.	2.1 Site/area management 5.3 Private sector standards and codes  1.2 Resource and habitat protection  8.2 Monitoring	All species

Table 23 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
Collisions with communications towers cause bird mortality, particularly during migration.	1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with man-made structures	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing mortality to birds when constructing new communications towers. Switch off solid lights on existing towers and ensure that remaining lights have a synchronized, complete dark phase. Take steps to ensure that new towers avoid guy wires and minimize height, and avoid topographic locations where migrating birds are likely to be found in abundance. Retrofit existing towers to adhere to as many guidelines as possible.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with power lines and accidental electrocution cause bird mortality.	4.2 Utility and service lines	Reduce mortality from collisions with utility lines / transmission towers	2.7 Reduce incidental mortality from collisions.	In high-risk areas, retrofit power lines so that the risk of electrocution of raptors is minimized. In new developments, locate transmission lines underground.  Use markers or paint to increase visibility of power lines in high-strike areas. Avoid siting lines over or near wetlands.	2.1 Site/area management	Waterfowl, herons, raptors
Collisions and entanglement in barbed-wire fences cause bird mortality.	2.3 Livestock farming & ranching	Reduce mortality from collisions and entanglement with barbed wire fences	2.7 Reduce incidental mortality from collisions.	Remove unneeded or unused wire fences. Install markers or high-visibility top wire on remaining wire fences, particularly near creeks or wetlands.	2.1 Site/area management	Prairie Falcon, Short-eared Owl
Collisions with vehicles cause bird mortality.	4.1 Roads and railroads	Reduce mortality from collisions with vehicles	2.7 Reduce incidental mortality from collisions.	Erect road signs or speed bumps to lower vehicle speeds where bird activity is frequent.  Remove plants that attract birds from roadsides and medians. Landscape along roads using taller trees and bushes to cause birds to fly higher.	2.1 Site/area management	Barn Swallow, Common Nighthawk, Evening Grosbeak, Lewis's Woodpecker, Northern Pygmy-owl, Northern Saw-whet Owl, Pine Siskin, Red Crossbill, Short-eared Owl, Swainson's Hawk, Western

Table 23 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
				Encourage the use of salt management plans to avoid unnecessary use of particulate salt (a bird attractant) on roads.  Avoid locating roads in valuable bird habitat.	1.1 Site/area protection	Screech-owl ( <i>macfarlanei</i> ), Yellow-breasted Chat
Population effects of collisions are unknown.	12.1 Information lacking	Improve understanding of population effects of mortality from collisions	7.4 Improve understanding of causes of population declines.	Assess the biological importance of bird kills from all sources of collisions.	8.1 Research	All species
<b>Predation by domestic cats</b>						
Predation by domestic and feral cats.	8.1 Invasive non-native/ alien species	Reduce mortality from domestic and feral cats	2.4 Reduce incidental mortality.	Implement a “Cats Indoors!” Campaign following the guidelines of the American Bird Conservancy. Work to reduce feral cat overpopulation through cat control regulations.	5.3 Private sector standards and codes  5.2 Policies and regulations	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
Population effects of cat predation are unknown.	12.1 Information lacking	Improve understanding of population effects of cat predation	7.4 Improve understanding of causes of population declines.	Evaluate which species are most vulnerable to cat predation. Investigate the population-level effects of cat predation through better monitoring of kill rates and the number of feral cats. Continue to monitor bird populations so changes in numbers and distributions can be identified and management of cats can be altered to reflect these changes. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.	8.1 Research  8.2 Monitoring	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas

Table 23 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
<b>Environmental Contaminants</b>						
Mortality, sub-lethal effects, reductions in prey populations and habitat alteration caused by exposure to/use of pesticides.	9.3 Agricultural & forestry effluents	Reduce mortality and sub-lethal effects of pesticides on birds  Reduce the effects of pesticides on prey species	2.1 Reduce mortality and/or sub-lethal effects from pesticide use.  5.1 Maintain natural food webs and prey sources.	Substantially reduce the use of pesticides/rodenticides/herbicides in Canada. Where elimination is not possible, they should be used as part of an integrated pest management system. Improve regulation of pesticides/rodenticides/herbicides in Canada to reduce bird mortality.	5.2 Policies and regulations 5.3 Private sector standards and codes	<b>Direct or indirect poisoning by pesticides:</b> American Wigeon, Canada Goose, Ferruginous Hawk, Horned Grebe, Horned Lark, Lewis's Woodpecker, Pine Siskin, Prairie Falcon, Williamson's Sapsucker, Yellow-breasted Chat <b>Reductions in prey due to pesticide use:</b> Barn Swallow, Black Tern, Common Nighthawk, Ferruginous Hawk, Flammulated Owl, Lark Sparrow, Lewis's Woodpecker, Northern Harrier, Swainson's Hawk, White-throated Swift, Williamson's Sapsucker
Mortality from ingestion of lead shot or tackle.	5.1 Hunting & collecting terrestrial animals 5.4 Fishing & harvesting aquatic resources	Reduce mortality and sub-lethal effects of lead shot and fishing tackle on birds	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Work with hunters, anglers and industry to eliminate the exposure of birds to shot, sinkers and jigs made of lead. Continue to enforce the use of non-toxic shot in waterfowl hunting, and encourage adoption of non-toxic alternatives in target shooting, upland game bird hunting, and fishing.	4.3 Awareness and communications  5.4 Compliance and enforcement	American Wigeon, Bufflehead, Canada Goose, Common Loon, Lesser Scaup, Mallard, Ring-necked Duck, Trumpeter Swan
Mortality from heavy metals and other contaminants.	9.2 Industrial & military effluents	Reduce mortality from heavy metals and other contaminants	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Work with industry and policy makers to reduce the quantity of heavy metals and other contaminants released into the environment.	5.3 Private sector standards and codes 5.2 Policies and regulations	American Dipper, Common Loon, Double-crested Cormorant

Table 23 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
Population effects of pollution are unknown.	12.1 information lacking	Improve understanding of population effects of pollution	7.4 Improve understanding of causes of population declines.	Evaluate the affects of PBDEs and other chemicals on vital rates in birds. Evaluate the extent to which pesticides are reducing prey availability for aerial insectivores. Improve the ability to monitor and understand the effects of contaminant concentrations in birds. Continue to acquire information on oiling of waterbirds through programs like Birds Oiled at Sea.	8.1 Research  8.2 Monitoring	All species

## Climate Change

The effects of climate change are already measureable in many bird habitats and have resulted in range shifts and changes in the timing of migration and breeding in some species (National Audubon Society 2009, North American Bird Conservation Initiative, U.S. Committee 2009). Birds in all habitats will be affected by climate change. The most vulnerable are predicted to be those that are dependent on oceanic ecosystems and those found in coastal, island, grassland, arctic and alpine habitats (North American Bird Conservation Initiative, U.S. Committee 2010). Changing climate may also facilitate the spread of disease, the introduction of new predators and the invasion of non-native species which alter habitat structure and community composition (North American Bird Conservation Initiative, U.S. Committee 2009, Faaborg et al. 2010). See Tables 24 and 25 for a summary of impacts of climate change and conservation objectives.

A recent exercise used bioclimatic modeling to predict changes in bird species ranges based on anticipated climate change for different time periods and under different emissions scenarios (Lawler et al. 2010). Bioclimatic models use statistical associations between the current range of a species and a suite of climate variables to predict future ranges under new climate conditions. The study focused on priority bird species currently found within Bird Conservation Regions in Canada. The results suggest that bird species turnover in Canada will be highest in northern Bird Conservation Regions as species ranges continue to shift northward in the coming decades. In BCR 10, the model predicts a gain of 50 species, a loss of 24 species for a total turnover (species gains + species losses) of 32% by the period 2071-2100.

In BCR 10, the effects of changing climate are already apparent. Spring, summer and winter temperatures have increased and glaciers are retreating. Spring and fall precipitation have also increased, and more precipitation is falling as rain and less as snow. These changes have resulted in shorter winters and earlier and stronger winter/spring runoff and reduced summer/fall flows. Across British Columbia, average annual temperatures are expected to continue to rise. As more winter precipitation falls as rain rather than snow, glaciers will continue to retreat, snowpack will decline, and flood frequency and severity will likely increase. Geographical shifts in vegetation are expected for many species as climatic envelopes shift markedly upslope and northward, and will result in the redistribution of ecosystems on the landscape. Rates of individual species movement will vary widely, however. Many species (e.g., trees) are likely to take decades or centuries to move accordingly, while some birds within BCR 10 have already shifted northwards and/or show increased density in the northern portions of their ranges. Increases in temperature and reduced summer flows will negatively impact wetlands, lowering water levels and drying out smaller wetlands. Grassland, shrub-steppe, and dry forest are expected to expand upslope and northwards. Moist interior conifer forests are also expected to move upslope/northwards at the expense of subalpine and sub-boreal zones, and there is great potential for the loss of alpine habitats to upslope forest encroachment. Increases in the number and variety of forest pests are expected, and climate change has already contributed to the intensification of pest outbreaks. Warmer winters and earlier springs have increased overwinter survival of the mountain pine beetle and enabled earlier egg-laying



and hatching, contributing to the scale of the current outbreak in BCR 10 (CIJV Technical Committee 2010, Pojar 2010).

To maintain healthy bird populations in the face of a changing climate, conservation must be carefully planned and must be implemented so as to buffer birds from the negative impacts of climate change wherever possible (Faaborg et al. 2010).

**Table 24. Examples of the current and anticipated effects of climate change on bird populations in Canada and some affected bird species.**

(**Note:** the species shown here do not represent an exhaustive list, rather, they provide examples of species for which the effects of climate change have been suggested or documented).

Climate change risk	Threat category	Example priority species affected
Direct bird mortality due to temperature extremes.	11.3 Temperature extremes	Barn Swallow, Canyon Wren, Common Nighthawk, Olive-sided Flycatcher
Reductions in food availability (e.g., nectar, invertebrates) and/or mismatches in the timing of breeding and peak food abundance due to phenological shifts, droughts, or temperature extremes.	11.1 Habitat shifting & alteration 11.2 Droughts 11.3 Temperature extremes	Barn Swallow, Black Swift, Calliope Hummingbird, Canyon Wren, Common Nighthawk, Olive-sided Flycatcher, Rufous Hummingbird
Loss or alteration of habitat due to changes in climate (e.g., loss of alpine and subalpine, altered hydrology, drying/shrinking of wetlands).	11.1 Habitat shifting & alteration 11.2 Droughts	<p><b>Alpine and sub-alpine:</b> Brewer's Sparrow (<i>taverneri</i>), Clark's Nutcracker, Dusky Grouse, Horned Lark, White-tailed Ptarmigan</p> <p><b>Waterbodies:</b> American White Pelican, Barrow's Goldeneye, Bufflehead, Black Swift, Harlequin Duck</p> <p><b>Wetlands:</b> American Avocet, American Bittern, Cinnamon Teal, Hooded Merganser, Horned Grebe, Lesser Scaup, Mallard, Ring-necked Duck, Rusty Blackbird, Trumpeter Swan, White-winged Scoter, Wilson's Phalarope</p>

Table 25. Proposed conservation objectives and actions to address climate change.

Threats addressed	Threat sub-category	Objective	Objective category	Recommended Actions	Action category	Priority species affected
Climate change impacts habitat and negatively affects survival and productivity of birds	11.1 Habitat shifting and alteration	<p>Reduce greenhouse gas emissions</p> <p>Mitigate the effects of climate change on bird habitat</p>	<p>6.1 Support efforts to reduce greenhouse gas emissions</p> <p>6.2 Manage for habitat resilience as climate changes</p>	<p>Support Canada's effort to reduce Green House gas emissions.</p> <p>Manage for habitat resilience to allow ecosystems to adapt despite disturbances and changing conditions. Minimize anthropogenic stressors (such as development or pollution) to help maintain resilience.</p> <p>Manage buffer areas and the matrix between protected areas to enhance movement of species across the landscape.</p> <p>Manage ecosystems to maximize carbon storage and sequestration while simultaneously enhancing bird habitat.</p> <p>Incorporate predicted shifts in habitat into landscape level plans (e.g., when establishing protected areas ensure the maintenance of north-south corridors to facilitate northward range shifts of bird species).</p>	<p>5.2 Policies and regulations</p> <p>1.1 Site/area protection</p> <p>2.1 Site/area management</p> <p>5.2 Policies and regulations</p>	All



## ***Research and Population Monitoring Needs***

### **Population Monitoring**

An estimate of population trend for each species is necessary for the development of elements 1 and 3 (Species Assessment and Population Objectives). However, there are many species for which we are currently unable to estimate a population trend (PT) score. These species were typically assigned a population objective of “assess/maintain.” The inability to estimate a PT score may be the result of a lack of monitoring data for the BCR as a whole or may be because certain species are not well captured by common monitoring techniques. To be able to effectively evaluate species believed to be of conservation concern, and to track those not yet of concern for future changes in status, we require more comprehensive monitoring that enables us to generate population trends for all species of birds in Canada. However, it is important to note that for some species, population trends are better understood at scales larger or smaller than the BCR unit, and lack of BCR-scale population trend data should not preclude acting to conserve these priority species.

For example, the PIF species assessment database (Rocky Mountain Bird Observatory 2005) and local re-analysis of BBS data yields a PT of 3 for many priority waterfowl (10 of 12 species) in BCR 10. However, waterfowl are subject to widespread and intense monitoring on their breeding grounds, and population trends are typically well-understood at the flyway scale. It is for this reason we set population objectives for waterfowl from the Canadian Intermountain Joint Venture’s Biological Foundation and Prospectus (CIJV 2003) and Implementation Plan (CIJV Technical Committee, 2010) rather than directly from local PT scores.

Similarly, the PIF species assessment database and local re-analysis of BBS data yielded PT scores of 3 for all priority shorebirds (4 species) and most waterbirds (9 of 10 waterbird species). Both shorebirds and waterbirds are poorly sampled by the BBS. However, for many of these species (3 of 4 shorebirds, and 6 of 10 waterbirds), population trends are better understood at a national scale (see PT scores from national assessments in *Wings Over Water: Canada’s Waterbird Conservation Plan* (Milko et al. 2003) and the *Canadian Shorebird Conservation Plan* (Donaldson et al. 2000)). In addition, for some colonial waterbirds (e.g., American White Pelican, Double-crested Cormorant, Western Grebe) are relatively easily monitored via colony counts, though this information does not always scale up to the entire BCR.

BBS data yield much better information for landbirds, though population trends remain uncertain at the BCR scale for some landbird species. Our inability to more accurately assess population trends for these species may result from a lack of monitoring in remote or difficult-to-access areas. Many of the landbird species with a PT of 3 are also from groups known to be poorly sampled by BBS methods (e.g., raptors, owls, woodpeckers). The rugged and remote nature of much of BCR 10, combined with its small human population, means that many areas have poor or non-existent coverage by volunteer-based survey efforts such as the BBS and Christmas Bird Count. Despite some shortcomings, these programs provide much of the population trend data that exist, and maintaining these programs is critical. Supporting the expansion of these programs into under-sampled habitats and remote areas, particularly more northerly and high-elevation areas, will improve their utility in the future.

Specific recommendations for some priority species with unknown or uncertain population trends are presented in Table 26.

Table 26. Categories of poorly monitored species, possible monitoring approaches, and example priority species which would benefit in BCR 10.

Category	Example priority species	Possible monitoring approaches
Aerial insectivores	White-throated Swift	Conduct regular colony counts for White-throated Swift. Initial surveys may be needed to locate breeding areas.
Diurnal raptors	Ferruginous Hawk, Peregrine Falcon ( <i>anatum</i> ), Prairie Falcon	For rare species, periodically survey known/suspected aeries for occupancy (Ferruginous Hawk, Prairie Falcon, Peregrine Falcon [ <i>anatum</i> ]).
Nocturnal raptors	Flammulated Owl, Northern Pygmy-Owl, Northern Saw-whet Owl, Western Screech-Owl ( <i>macfarlanei</i> )	Support, continue and expand Nocturnal Owl Surveys. Species-specific surveys may be required in some cases, such as dawn surveys for Northern Pygmy-owl and May/June surveys for Flammulated Owl.
Hummingbirds	Calliope Hummingbird, Rufous Hummingbird	Coordinate with the Western Hummingbird Partnership and the Hummingbird Monitoring Network to design and implement an effective hummingbird monitoring program that will build upon existing programs.
Wetland-associated species	Black Tern, Hooded Merganser, Horned Grebe, Rusty Blackbird	Implement, support and expand Marsh Monitoring Programs similar to those in the Great Lakes Basin.
Colonial waterbirds	American White Pelican, Double-crested Cormorant, Forster's Tern, Western Grebe	Conduct regular counts at Stum Lake (American White Pelican and Double-crested Cormorant), Shuswap Lake (Western Grebe) and the Creston Valley (Double-crested Cormorant, Forster's Tern, Western Grebe).  Periodically survey historical Western Grebe breeding sites for current breeding activity.
Species inhabiting poorly-sampled habitat	American Dipper, Brewer's Sparrow ( <i>taverneri</i> ), Clark's Nutcracker, Common Loon, Harlequin Duck, Rusty Blackbird, White-tailed Ptarmigan	Increase Breeding Bird Survey coverage of remote or poorly-sampled habitats, such as alpine and subalpine areas (Brewer's Sparrow [ <i>taverneri</i> ], Clark's Nutcracker, White-tailed Ptarmigan), forested wetlands (Rusty Blackbird) and aquatic habitats such as lakes (Common Loon) and rivers (American Dipper, Harlequin Duck). Modified or separate methodology may be required in some habitats.
Other species captured by Breeding Bird Survey, but currently lacking enough data for trend analysis in the BCR.	Bobolink, Cassin's Vireo, Dusky Grouse, Golden-crowned Kinglet, Hammond's Flycatcher, Lark Sparrow, Long-billed Curlew, Pygmy Nuthatch, Red-naped Sapsucker, Ruffed Grouse, Sharp-tailed Grouse, Townsend's Solitaire, Townsend's Warbler, Upland Sandpiper, Western Tanager, Willow Flycatcher	Increase Breeding Bird Survey coverage in all habitats (both density of routes and geographic coverage), particularly grasslands, to increase data and improve trend information on under sampled species.

To be able to effectively evaluate species believed to be of conservation concern, and to track those not yet of concern for future changes in status, we require more comprehensive monitoring that enables us to generate population trends for all species of birds in Canada.

A recent Environment Canada review (Avian Monitoring Review Steering Committee. 2012) of avian monitoring programs in Canada made the following recommendations for each of the four main species groups:

#### Landbirds

- develop options for on-the-ground monitoring across boreal Canada;
- evaluate the ability of migration monitoring and checklist surveys to contribute to Environment Canada's monitoring needs; and
- evaluate the feasibility and cost-effectiveness of improving demographic monitoring to help understand causes of population change.

#### Shorebirds

- complete a first round of Arctic PRISM breeding shorebird surveys to obtain reliable population estimates and baseline distribution information across the Arctic;
- develop more reliable sampling methods for counting shorebirds in migration to address concerns about bias; and
- increase Latin American involvement in monitoring shorebirds on the wintering grounds, including Red Knot.

#### Waterbirds

- evaluate alternative strategies for filling gaps in coverage for both colonial waterbirds and marsh birds;
- consider both costs and potential reduction in risks; and
- carry out any necessary pilot work to evaluate options.

#### Waterfowl

- develop strategies to reduce expenditures on the prairie and eastern waterfowl breeding surveys, while retaining acceptable precision in population estimates;
- review the information needs and expenditures for arctic goose and duck banding programs;
- reduce the number of Greater Snow Goose survey components;
- redesign the Trumpeter Swan surveys; and
- realign resources for eider and scoter monitoring to a more efficient suite of surveys.

### Research

The focus of this section is to outline the main areas where a lack of information hindered our ability to understand conservation needs and make conservation recommendations. Research objectives presented here are bigger picture questions, and not necessarily a schedule of studies, that are needed to determine the needs of individual species (Table 27). Undertaking research will allow us to improve future iterations of BCR strategies and to focus future implementation, and will also enable the development of new tools for conservation.



**Table 27. General research objectives in BCR 10.**

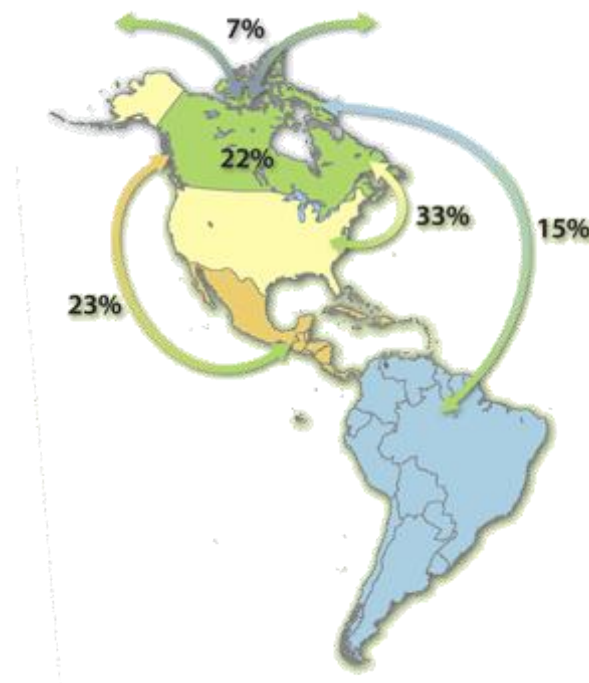
Objective	Example priority species affected
<p>For all priority bird species exhibiting declines in BCR 10, or those that are known to be declining nationally or continentally:</p> <p>Determine the primary drivers of population decline (e.g., productivity, juvenile survival, adult breeding season survival, overwinter survival) to identify when and where species are being limited.</p> <p>Assess threats identified for these species (both within and outside Canada for migratory species) to determine the degree to which they are driving population trends.</p>	<p><b>Species exhibiting declines in BCR 10:</b> American Bittern, Barn Swallow, Black Swift, Cassin's Finch, Common Nighthawk, Dusky Flycatcher, Evening Grosbeak, Horned Lark, Lewis's Woodpecker, Northern Goshawk, Northern Harrier, Olive-sided Flycatcher, Pine Siskin, Swainson's Hawk, Swainson's Thrush, Yellow Warbler</p> <p><b>Additional species exhibiting declining trends nationally or continentally:</b> Black Tern, Bobolink, Canyon Wren, Forster's Tern, Horned Grebe, Lesser Scaup, Long-billed Curlew, Ruffed grouse, Rufous Hummingbird, Rusty Blackbird, Short-eared Owl, White-throated Swift, White-winged Scoter, Willow Flycatcher, Wilson's Phalarope</p>
<p>Conduct, support, and continue research addressing widespread declines in aerial insectivores.</p>	<p>Barn Swallow, Black Swift, Common Nighthawk, Dusky Flycatcher, Hammond's Flycatcher, Olive-sided Flycatcher, White-throated Swift, Willow Flycatcher</p>
<p>Conduct, support, and continue research addressing widespread declines in grassland species.</p> <p>Map land cover changes that have occurred across the BCR between the baseline time periods established in BCR plans and the current day in order to correlate habitat loss with species declines and assess the main types of habitat transitions that have occurred (e.g. wetlands to agriculture, native grassland/shrubsteppe to ranching or agriculture; changes in forest age and structure with harvest, fire, and insect infestation).</p> <p>Combine up-to-date land cover information, additional data on bird densities, and detailed bird-habitat relationships for all priority species to allow for the calculation of quantitative habitat targets and to directly link conservation and population objectives.</p> <p>Identify priority areas for implementation of recommendations in BCR plans.</p> <p>Determine specific population connectivity and migration routes between breeding and wintering areas, using techniques such as genetic analysis, stable isotopes and geolocators.</p> <p>Where they do not already exist, conduct research to develop sector-specific beneficial management practices documents, with an emphasis on bird and biodiversity conservation. Monitor adherence to these BMPs and assess their effectiveness at preserving and/or increasing priority bird populations.</p> <p>Determine the population-level significance of bird mortality from collisions with anthropogenic structures of all types and predation by domestic cats. Identify particularly vulnerable species.</p>	<p>Bobolink, Horned Lark, Lark Sparrow, Long-billed Curlew, Sharp-tailed Grouse, Upland Sandpiper All species for which habitat-related declines have occurred or are suspected.</p> <p>All priority species.</p> <p>All priority species.</p> <p>All non-resident species.</p> <p>All priority species.</p> <p>All priority species.</p>

Table 27 continued

Objective	Example priority species affected
<p>Continue to engage in and support climate change research with respect to:</p> <ul style="list-style-type: none"> <li>-changes in hydrology (quantity and timing of snowfall and rain, timing of snowmelt, and retreating glaciers) and resultant impacts on wetland extent, type, and quality.</li> <li>-habitat alteration and loss, particularly changing forest types, the shifting grassland/forest interface, and loss of alpine and subalpine habitats.</li> <li>-potential increases in insect/disease outbreak frequency and intensity (e.g., mountain pine beetle).</li> <li>-range expansion or contraction of priority bird species.</li> <li>-identification of vulnerable species.</li> </ul>	All priority species.

### ***Threats Outside Canada***

Many bird species found in Canada spend a large portion of their lifecycle outside of the country (Fig. 26). These species face threats while they are outside Canada; in fact, threats to some migratory species may be most severe outside of the breeding season (Calvert et al. 2009). Of the 79 priority species in BCR 10, 59 (75%) are migratory and spend part of their annual cycle—up to half the year or more—outside Canada.



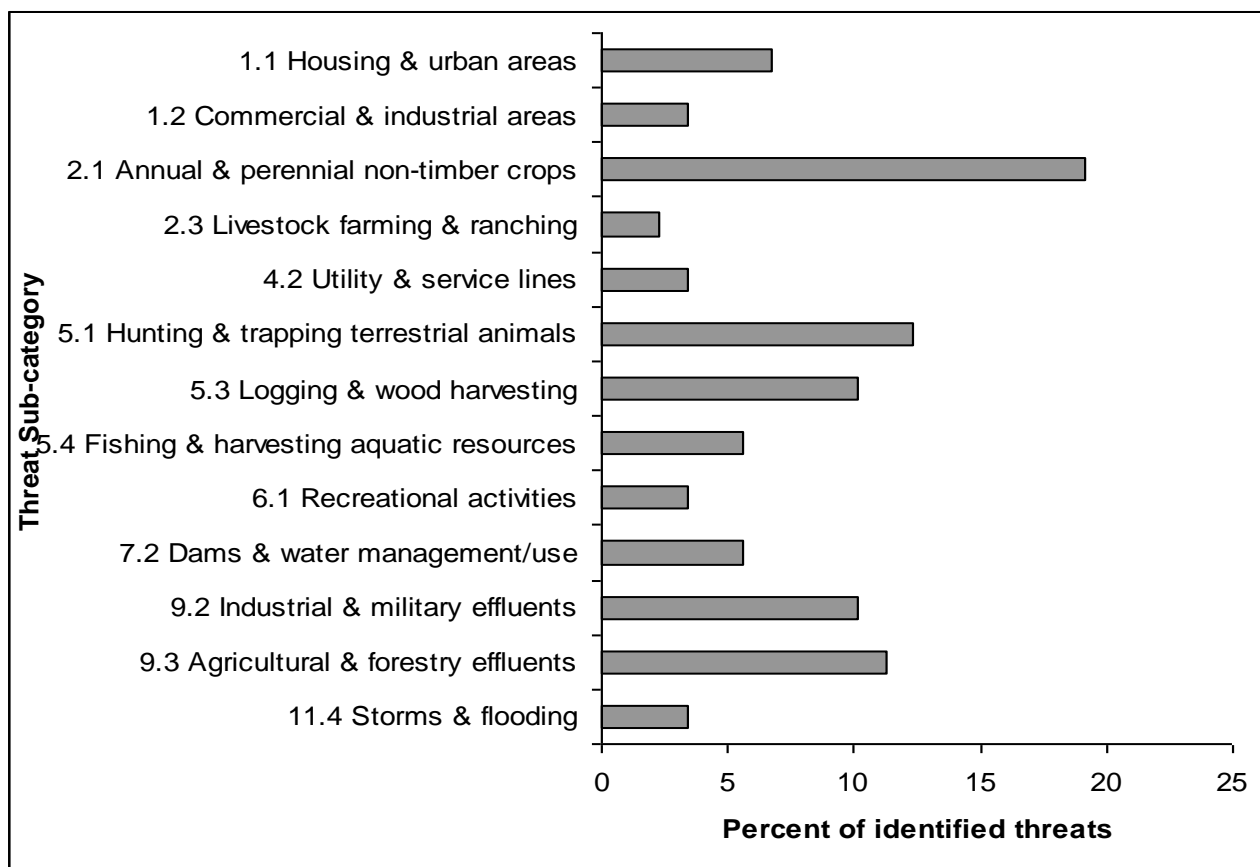
**Figure 26. Percent of Canadian breeding birds that migrate to regions outside of Canada for part of their life cycle (NABCI 2012).**

Birds are some of the most mobile species on the planet, and some species are true global wanderers. Priority birds from BCR 10 range widely throughout North, Central and South America. Migrant songbirds from BCR 10 are particularly reliant on central and western Mexico, with many species, including Cassin's Vireo, Dusky Flycatcher, Lazuli Bunting, Townsend's Warbler, and Western Tanager wintering in those areas. Some species travel much further, such as the Bobolink, Swainson's Hawk, and Upland Sandpiper; all of which migrate to the pampas grasslands of Argentina, Uruguay and southern Brazil.

Our migratory priority species face threats throughout their life cycles, both within and outside Canada (Fig. 27). Outside Canada, key migration, wintering and breeding habitats can be lost or degraded through development, agriculture, forestry, resource extraction or other human activities. Some species, such as Calliope Hummingbird, have relatively small and concentrated wintering ranges where any habitat degradation or loss could have major impacts on the species population. Others can be particularly vulnerable if large proportions of the species'

population concentrate at just a handful of key migratory stopover sites; degradation or loss of these sites could have devastating impacts. Birds may be incidentally killed by colliding with man-made structures; lit communications towers and tall buildings can pose a major hazard to night-migrating birds. Birds can be exposed to toxic pollutants, including chemicals which may be banned or tightly regulated in Canada and the United States but are more freely available elsewhere. While the United States and Mexico have passed laws similar to Canada's Migratory Birds Convention Act, 1994, which provide legal protection to many birds, other countries have not and migratory birds can be threatened by unsustainable or illegal hunting and persecution.

Similar to the assessment of threats facing priority species within Canada, we conducted a literature review to identify threats facing priority species while they are outside Canada. A lack of data was a pervasive issue for this exercise. For many species, little is known about threats they face during migration or while on their wintering grounds. Indeed, for some species, their wintering ranges and habitat use are only poorly known, if at all. There is also little information linking specific wintering areas to particular breeding populations, making it difficult to connect declines in breeding populations to potential problems on the wintering grounds. In addition, what data exist on wintering migrant species are heavily biased towards work done in the United States and little research is available from Mexico, Central and South America. While many of the threats identified in the United States likely affect species throughout their range, unique issues outside of the United States may have been missed. An absence of threats in a region may reflect that the necessary research has not yet been conducted (or may not be published in English). Because information on bird distributions during the non-breeding season is limited, we were unable to assess the scope and severity of threats to priority species while they are outside of Canada.



**Figure 27. Percent of identified threats to priority species (by threat sub-category) in BCR 10 when they are outside Canada.**

**Note:** Magnitudes could not be assigned for threats outside Canada due to lack of information on scope and severity. Categories representing  $\leq 1\%$  of identified threats are omitted for clarity. *5.1 Hunting and trapping terrestrial animals* includes hunting, lead poisoning from ingestion of spent shot, and accidental mortality of non-target species in pest bird control programs. *5.4 Fishing and harvesting aquatic resources* refers primarily to bycatch of birds in fisheries. *9.2 Industrial and military effluents* refers to the effects of oil, heavy metals and other contaminants such as PCBs, while *9.3 Agricultural and forestry effluents* refers to pesticides.

Loss of stopover, migration, and/or wintering habitat to urbanization, timber harvest, water management/use, and particularly agricultural conversion and intensification were frequently identified as threats to BCR 10's migratory priority species (Fig. 27). In addition, priority species face incidental mortality from a variety of sources such as exposure to oil, pesticides and other contaminants, collisions with man-made structures while migrating, fisheries bycatch, and hunting/persecution. Many threats to priority birds on migration and the wintering grounds are poorly documented and we were unable to accurately assess their scope and severity; consequently we were unable to assign magnitudes to individual threats facing BCR 10's priority species while they are outside Canada.

## Next Steps

The primary aims of BCR strategies are to present Environment Canada's priorities with respect to migratory bird conservation, and to provide a comprehensive overview of the conservation needs of bird populations to practitioners who may then undertake activities that promote bird conservation in Canada and internationally. Users from all levels of government, Aboriginal communities, the private sector, academia, NGOs and citizens will benefit from the information. BCR strategies can be used in many different ways depending on the needs of the user, who may focus on one or more of the elements of the strategy to guide their conservation projects.

BCR strategies will be updated periodically. Errors, omissions, and additional sources of information may be provided to [Environment Canada](#) at any time for inclusion in subsequent versions.

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## Appendix 1

### List of All Bird Species in BCR 10: Northern Rockies

Table A1. Complete list of species in BCR 10, when they are in the BCR (breeding, migrant, winter) and their priority status.

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Empidonax alnorum</i>	Alder Flycatcher	Moucherolle des aulnes	Landbird	Y		
<i>Corvus brachyrhynchos</i>	American Crow	Corneille d'Amérique	Landbird	Y	Y	
<i>Cinclus mexicanus</i>	American Dipper	Cincle d'Amérique	Landbird	Y	Y	Y
<i>Carduelis tristis</i>	American Goldfinch	Chardonneret jaune	Landbird	Y	Y	
<i>Falco sparverius</i>	American Kestrel	Crécerelle d'Amérique	Landbird	Y		
<i>Anthus rubescens</i>	American Pipit	Pipit d'Amérique	Landbird	Y		
<i>Setophaga ruticilla</i>	American Redstart	Paruline flamboyante	Landbird	Y		
<i>Turdus migratorius</i>	American Robin	Merle d'Amérique	Landbird	Y	Y	
<i>Picoides dorsalis</i>	American Three-toed Woodpecker	Pic à dos rayé	Landbird	Y	Y	
<i>Spizella arborea</i>	American Tree Sparrow	Bruant hudsonien	Landbird	Y	Y	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Pygargue à tête blanche	Landbird	Y	Y	
<i>Riparia riparia</i>	Bank Swallow	Hirondelle de rivage	Landbird	Y		
<i>Hirundo rustica</i>	Barn Swallow	Hirondelle rustique	Landbird	Y		Y
<i>Strix varia</i>	Barred Owl	Chouette rayée	Landbird	Y	Y	
<i>Megaceryle alcyon</i>	Belted Kingfisher	Martin-pêcheur d'Amérique	Landbird	Y		
<i>Cypseloides niger</i>	Black Swift	Martinet sombre	Landbird	Y		Y
<i>Picoides arcticus</i>	Black-backed Woodpecker	Pic à dos noir	Landbird	Y	Y	
<i>Pica hudsonia</i>	Black-billed Magpie	Pie d'Amérique	Landbird	Y	Y	
<i>Poecile atricapillus</i>	Black-capped Chickadee	Mésange à tête noire	Landbird	Y	Y	
<i>Archilochus alexandri</i>	Black-chinned Hummingbird	Colibri à gorge noire	Landbird	Y		
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	Cardinal à tête noire	Landbird	Y		
<i>Dendroica striata</i>	Blackpoll Warbler	Paruline rayée	Landbird	Y		
<i>Cyanocitta cristata</i>	Blue Jay	Geai bleu	Landbird	Y	Y	
<i>Vireo solitarius</i>	Blue-headed Vireo	Viréo à tête bleue	Landbird	Y		
<i>Dolichonyx oryzivorus</i>	Bobolink	Goglu des prés	Landbird	Y		Y
<i>Bombicilla garrulus</i>	Bohemian Waxwing	Jaseur boréal	Landbird	Y	Y	
<i>Poecile hudsonica</i>	Boreal Chickadee	Mésange à tête brune	Landbird	Y	Y	
<i>Aegolius funereus</i>	Boreal Owl	Nyctale de Tengmalm	Landbird	Y	Y	
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	Quiscale de Brewer	Landbird	Y		
<i>Spizella breweri taverneri</i>	Brewer's Sparrow ( <i>taverneri</i> )	Bruant de Brewer ( <i>taverneri</i> )	Landbird	Y		Y

Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Certhia americana</i>	Brown Creeper	Grimpereau brun	Landbird	Y	Y	
<i>Molothrus ater</i>	Brown-headed Cowbird	Vacher à tête brune	Landbird	Y		
<i>Icterus bullockii</i>	Bullock's Oriole	Oriole de Bullock	Landbird	Y		
<i>Athene cunicularia</i>	Burrowing Owl	Chevêche des terriers	Landbird	Y		
<i>Callipepla californica</i>	California Quail	Colin de Californie	Landbird	Y	Y	
<i>Stellula calliope</i>	Calliope Hummingbird	Colibri calliope	Landbird	Y		Y
<i>Catherpes mexicanus</i>	Canyon Wren	Troglodyte des canyons	Landbird	Y		Y
<i>Carpodacus cassinii</i>	Cassin's Finch	Roselin de Cassin	Landbird	Y	Y	Y
<i>Vireo cassinii</i>	Cassin's Vireo	Viréo de Cassin	Landbird	Y		Y
<i>Bombycilla cedrorum</i>	Cedar Waxwing	Jaseur d'Amérique	Landbird	Y	Y	
<i>Poecile rufescens</i>	Chestnut-backed Chickadee	Mésange à dos marron	Landbird	Y	Y	
<i>Spizella passerina</i>	Chipping Sparrow	Bruant familial	Landbird	Y		
<i>Nucifraga columbiana</i>	Clark's Nutcracker	Cassenois d'Amérique	Landbird	Y	Y	Y
<i>Spizella pallida</i>	Clay-colored Sparrow	Bruant des plaines	Landbird	Y		
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	Hirondelle à front blanc	Landbird	Y		
<i>Quiscalus quiscula</i>	Common Grackle	Quiscale bronzé	Landbird	Y		
<i>Chordeiles minor</i>	Common Nighthawk	Engoulevent d'Amérique	Landbird	Y		Y
<i>Phalaenoptilus nuttallii</i>	Common Poorwill	Engoulevent de Nuttall	Landbird	Y		
<i>Corvus corax</i>	Common Raven	Grand Corbeau	Landbird	Y	Y	
<i>Carduelis flammea</i>	Common Redpoll	Sizerin flammé	Landbird		Y	
<i>Geothlypis trichas</i>	Common Yellowthroat	Paruline masquée	Landbird	Y		
<i>Accipiter cooperii</i>	Cooper's Hawk	Épervier de Cooper	Landbird	Y		
<i>Junco hyemalis</i>	Dark-eyed Junco	Junco ardoisé	Landbird	Y	Y	
<i>Picoides pubescens</i>	Downy Woodpecker	Pic mineur	Landbird	Y	Y	
<i>Empidonax oberholseri</i>	Dusky Flycatcher	Moucherolle sombre	Landbird	Y		Y
<i>Dendragapus obscurus</i>	Dusky Grouse	Tétras sombre	Landbird	Y	Y	Y
<i>Tyrannus tyrannus</i>	Eastern Kingbird	Tyran tritri	Landbird	Y		
<i>Sturnus vulgaris</i>	European Starling	Étourneau sansonnet	Landbird	Y	Y	
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Gros-bec errant	Landbird	Y	Y	Y
<i>Buteo regalis</i>	Ferruginous Hawk	Buse rouilleuse	Landbird	Y		Y
<i>Otus flammeolus</i>	Flammulated Owl	Petit-duc nain	Landbird	Y		Y
<i>Passerella iliaca</i>	Fox Sparrow	Bruant fauve	Landbird	Y		
<i>Aquila chrysaetos</i>	Golden Eagle	Aigle royal	Landbird	Y	Y	
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Roitelet à couronne dorée	Landbird	Y	Y	Y
<i>Zonotrichia atricapilla</i>	Golden-crowned Sparrow	Bruant à couronne dorée	Landbird	Y		
<i>Dumetella carolinensis</i>	Gray Catbird	Moqueur chat	Landbird	Y		
<i>Perisoreus canadensis</i>	Gray Jay	Mésangeai du Canada	Landbird	Y	Y	

Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Leucosticte tephrocotis</i>	Gray-crowned Rosy-Finch	Roselin à tête grise	Landbird	Y	Y	
<i>Strix nebulosa</i>	Great Gray Owl	Chouette lapone	Landbird	Y	Y	
<i>Bubo virginianus</i>	Great Horned Owl	Grand-duc d'Amérique	Landbird	Y	Y	
<i>Picoides villosus</i>	Hairy Woodpecker	Pic chevelu	Landbird	Y	Y	
<i>Empidonax hammondi</i>	Hammond's Flycatcher	Moucherolle de Hammond	Landbird	Y		Y
<i>Catharus guttatus</i>	Hermit Thrush	Grive solitaire	Landbird	Y		
<i>Carduelis hornemanni</i>	Hoary Redpoll	Sizerin blanchâtre	Landbird		Y	
<i>Eremophila alpestris</i>	Horned Lark	Alouette hausse-col	Landbird	Y	Y	Y
<i>Carpodacus mexicanus</i>	House Finch	Roselin familier	Landbird	Y	Y	
<i>Passer domesticus</i>	House Sparrow	Moineau domestique	Landbird	Y	Y	
<i>Troglodytes aedon</i>	House Wren	Troglodyte familier	Landbird	Y		
<i>Chondestes grammacus</i>	Lark Sparrow	Bruant à joues marron	Landbird	Y		Y
<i>Passerina amoena</i>	Lazuli Bunting	Passerin azuré	Landbird	Y		Y
<i>Empidonax minimus</i>	Least Flycatcher	Moucherolle tchébec	Landbird	Y		
<i>Melanerpes lewis</i>	Lewis's Woodpecker	Pic de Lewis	Landbird	Y		Y
<i>Melospiza lincolni</i>	Lincoln's Sparrow	Bruant de Lincoln	Landbird	Y		
<i>Asio otus</i>	Long-eared Owl	Hibou moyen-duc	Landbird	Y	Y	
<i>Oporornis tolmiei</i>	MacGillivray's Warbler	Paruline des buissons	Landbird	Y		
<i>Dendroica magnolia</i>	Magnolia Warbler	Paruline à tête cendrée	Landbird	Y		
<i>Cistothorus palustris</i>	Marsh Wren	Troglodyte des marais	Landbird	Y		
<i>Falco columbarius</i>	Merlin	Faucon émerillon	Landbird	Y	Y	
<i>Sialia currucoides</i>	Mountain Bluebird	Merlebleu azuré	Landbird	Y		
<i>Poecile gambeli</i>	Mountain Chickadee	Mésange de Gambel	Landbird	Y	Y	
<i>Zenaidura macroura</i>	Mourning Dove	Tourterelle triste	Landbird	Y	Y	
<i>Oreothlypis ruficapilla</i>	Nashville Warbler	Paruline à joues grises	Landbird	Y		
<i>Colaptes auratus</i>	Northern Flicker	Pic flamboyant	Landbird	Y	Y	
<i>Accipiter gentilis</i>	Northern Goshawk	Autour des palombes	Landbird	Y	Y	Y
<i>Circus cyaneus</i>	Northern Harrier	Busard Saint-Martin	Landbird	Y		Y
<i>Surnia ulula</i>	Northern Hawk Owl	Chouette épervière	Landbird	Y	Y	
<i>Glaucidium gnoma</i>	Northern Pygmy-Owl	Chevêchette naine	Landbird	Y	Y	Y
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	Hirondelle à ailes hérissées	Landbird	Y		
<i>Aegolius acadicus</i>	Northern Saw-whet Owl	Petite Nyctale	Landbird	Y	Y	Y
<i>Parkesia noveboracensis</i>	Northern Waterthrush	Paruline des ruisseaux	Landbird	Y		
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Moucherolle à côtés olive	Landbird	Y		Y
<i>Oreothlypis celata</i>	Orange-crowned Warbler	Paruline verdâtre	Landbird	Y		
<i>Pandion haliaetus</i>	Osprey	Balbusard pêcheur	Landbird	Y		
<i>Seiurus aurocapilla</i>	Ovenbird	Paruline couronnée	Landbird	Y		

Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Troglodytes pacifica</i>	Pacific Wren	Troglodyte mignon	Landbird	Y	Y	
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	Moucherolle côtier	Landbird	Y		
<i>Falco peregrinus anatum</i>	Peregrine Falcon ( <i>anatum</i> )	Faucon pèlerin ( <i>anatum</i> )	Landbird	Y		Y
<i>Dryocopus pileatus</i>	Pileated Woodpecker	Grand Pic	Landbird	Y	Y	
<i>Pinicola enucleator</i>	Pine Grosbeak	Durbec des sapins	Landbird	Y	Y	
<i>Carduelis pinus</i>	Pine Siskin	Tarin des pins	Landbird	Y	Y	Y
<i>Falco mexicanus</i>	Prairie Falcon	Faucon des prairies	Landbird	Y		Y
<i>Carpodacus purpureus</i>	Purple Finch	Roselin pourpré	Landbird	Y		
<i>Sitta pygmaea</i>	Pygmy Nuthatch	Sittelle pygmée	Landbird	Y	Y	Y
<i>Loxia curvirostra</i>	Red Crossbill	Bec-croisé des sapins	Landbird	Y	Y	Y
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Sittelle à poitrine rousse	Landbird	Y	Y	
<i>Sphyrapicus ruber</i>	Red-breasted Sapsucker	Pic à poitrine rouge	Landbird	Y		
<i>Vireo olivaceus</i>	Red-eyed Vireo	Viréo aux yeux rouges	Landbird	Y		
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker	Pic à nuque rouge	Landbird	Y		Y
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Buse à queue rousse	Landbird	Y	Y	
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	Carouge à épaulettes	Landbird	Y	Y	
<i>Phasianus colchicus</i>	Ring-necked Pheasant	Faisan de Colchide	Landbird	Y	Y	
<i>Columba livia</i>	Rock Pigeon	Pigeon biset	Landbird	Y	Y	
<i>Lagopus muta</i>	Rock Ptarmigan	Lagopède alpin	Landbird	Y	Y	
<i>Salpinctes obsoletus</i>	Rock Wren	Troglodyte des rochers	Landbird	Y		
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	Cardinal à poitrine rose	Landbird	Y		
<i>Buteo lagopus</i>	Rough-legged Hawk	Buse pattue	Landbird		Y	
<i>Regulus calendula</i>	Ruby-crowned Kinglet	Roitelet à couronne rubis	Landbird	Y	Y	
<i>Bonasa umbellus</i>	Ruffed Grouse	Gélinotte huppée	Landbird	Y	Y	Y
<i>Selasphorus rufus</i>	Rufous Hummingbird	Colibri roux	Landbird	Y		Y
<i>Euphagus carolinus</i>	Rusty Blackbird	Quiscale rouilleux	Landbird	Y		Y
<i>Passerculus sandwichensis</i>	Savannah Sparrow	Bruant des prés	Landbird	Y		
<i>Sayornis saya</i>	Say's Phoebe	Moucherolle à ventre roux	Landbird	Y		
<i>Accipiter striatus</i>	Sharp-shinned Hawk	Épervier brun	Landbird	Y		
<i>Tympanuchus phasianellus</i>	Sharp-tailed Grouse	Tétras à queue fine	Landbird	Y	Y	Y
<i>Asio flammeus</i>	Short-eared Owl	Hibou des marais	Landbird	Y	Y	Y
<i>Plectrophenax nivalis</i>	Snow Bunting	Bruant des neiges	Landbird		Y	
<i>Melospiza melodia</i>	Song Sparrow	Bruant chanteur	Landbird	Y		
<i>Pipilo maculatus</i>	Spotted Towhee	Tohi tacheté	Landbird	Y		
<i>Falci pennis canadensis</i>	Spruce Grouse	Tétras du Canada	Landbird	Y	Y	
<i>Cyanocitta stelleri</i>	Steller's Jay	Geai de Steller	Landbird	Y	Y	
<i>Buteo swainsoni</i>	Swainson's Hawk	Buse de Swainson	Landbird	Y		Y

Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Catharus ustulatus</i>	Swainson's Thrush	Grive à dos olive	Landbird	Y		Y
<i>Melospiza georgiana</i>	Swamp Sparrow	Bruant des marais	Landbird	Y		
<i>Vermivora peregrina</i>	Tennessee Warbler	Paruline obscure	Landbird	Y		
<i>Myadestes townsendi</i>	Townsend's Solitaire	Solitaire de Townsend	Landbird	Y	Y	Y
<i>Dendroica townsendi</i>	Townsend's Warbler	Paruline de Townsend	Landbird	Y		Y
<i>Tachycineta bicolor</i>	Tree Swallow	Hirondelle bicolore	Landbird	Y		
<i>Cathartes aura</i>	Turkey Vulture	Urubu à tête rouge	Landbird	Y		
<i>Ixoreus naevius</i>	Varied Thrush	Grive à collier	Landbird	Y		
<i>Chaetura vauxi</i>	Vaux's Swift	Martinet de Vaux	Landbird	Y		
<i>Catharus fuscescens</i>	Veery	Grive fauve	Landbird	Y		
<i>Poocetes gramineus</i>	Vesper Sparrow	Bruant vespéral	Landbird	Y		
<i>Tachycineta thalassina</i>	Violet-green Swallow	Hirondelle à face blanche	Landbird	Y		
<i>Vireo gilvus</i>	Warbling Vireo	Viréo mélodieux	Landbird	Y		
<i>Sialia mexicana</i>	Western Bluebird	Merlebleu de l'Ouest	Landbird	Y		
<i>Tyrannus verticalis</i>	Western Kingbird	Tyrann de l'Ouest	Landbird	Y		
<i>Sturnella neglecta</i>	Western Meadowlark	Sturnelle de l'Ouest	Landbird	Y		
<i>Megascops kennicottii macfarlanei</i>	Western Screech-Owl ( <i>macfarlanei</i> )	Petit-duc des montagnes ( <i>macfarlanei</i> )	Landbird	Y	Y	Y
<i>Piranga ludoviciana</i>	Western Tanager	Tangara à tête rouge	Landbird	Y		Y
<i>Contopus sordidulus</i>	Western Wood-Pewee	Pioui de l'Ouest	Landbird	Y		
<i>Sitta carolinensis</i>	White-breasted Nuthatch	Sittelle à poitrine blanche	Landbird	Y	Y	
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	Bruant à couronne blanche	Landbird	Y		
<i>Lagopus leucurus</i>	White-tailed Ptarmigan	Lagopède à queue blanche	Landbird	Y	Y	Y
<i>Zonotrichia albicollis</i>	White-throated Sparrow	Bruant à gorge blanche	Landbird	Y		
<i>Aeronautes saxatalis</i>	White-throated Swift	Martinet à gorge blanche	Landbird	Y		Y
<i>Loxia leucoptera</i>	White-winged Crossbill	Bec-croisé bifascié	Landbird	Y	Y	
<i>Meleagris gallopavo</i>	Wild Turkey	Dindon sauvage	Landbird	Y	Y	
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	Pic de Williamson	Landbird	Y		Y
<i>Empidonax traillii</i>	Willow Flycatcher	Moucherolle des saules	Landbird	Y		Y
<i>Lagopus lagopus</i>	Willow Ptarmigan	Lagopède des saules	Landbird	Y	Y	
<i>Wilsonia pusilla</i>	Wilson's Warbler	Paruline à calotte noire	Landbird	Y		
<i>Dendroica petechia</i>	Yellow Warbler	Paruline jaune	Landbird	Y		Y
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	Moucherolle à ventre jaune	Landbird	Y		
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	Pic maculé	Landbird	Y		
<i>Icteria virens</i>	Yellow-breasted Chat	Paruline polyglotte	Landbird	Y		Y
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird	Carouge à tête jaune	Landbird	Y		



Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Dendroica coronata</i>	Yellow-rumped Warbler	Paruline à croupion jaune	Landbird	Y		
<i>Recurvirostra americana</i>	American Avocet	Avocette d'Amérique	Shorebird	Y		Y
<i>Tringa melanoleuca</i>	Greater Yellowlegs	Grand Chevalier	Shorebird	Y		
<i>Charadrius vociferus</i>	Killdeer	Pluvier kildir	Shorebird	Y		
<i>Numenius americanus</i>	Long-billed Curlew	Courlis à long bec	Shorebird	Y		Y
<i>Tringa solitaria</i>	Solitary Sandpiper	Chevalier solitaire	Shorebird	Y		
<i>Actitis macularius</i>	Spotted Sandpiper	Chevalier grivelé	Shorebird	Y		
<i>Bartramia longicauda</i>	Upland Sandpiper	Maubèche des champs	Shorebird	Y		Y
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Phalarope de Wilson	Shorebird	Y		Y
<i>Gallinago delicata</i>	Wilson's Snipe	Bécassine de Wilson	Shorebird	Y		
<i>Botaurus lentiginosus</i>	American Bittern	Butor d'Amérique	Waterbird	Y		Y
<i>Fulica americana</i>	American Coot	Foulque d'Amérique	Waterbird	Y	Y	
<i>Pelecanus erythrorhynchos</i>	American White Pelican	Pélican d'Amérique	Waterbird	Y		Y
<i>Chlidonias niger</i>	Black Tern	Guifette noire	Waterbird	Y		Y
<i>Larus californicus</i>	California Gull	Goéland de Californie	Waterbird	Y		Y
<i>Gavia immer</i>	Common Loon	Plongeon huard	Waterbird	Y		Y
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Cormoran à aigrettes	Waterbird	Y	Y	Y
<i>Podiceps nigricollis</i>	Eared Grebe	Grèbe à cou noir	Waterbird	Y		
<i>Sterna forsteri</i>	Forster's Tern	Sterne de Forster	Waterbird	Y		Y
<i>Larus pipixcan</i>	Franklin's Gull	Mouette de Franklin	Waterbird			
<i>Ardea herodias</i>	Great Blue Heron	Grand Héron	Waterbird	Y	Y	Y
<i>Larus argentatus</i>	Herring Gull	Goéland argenté	Waterbird	Y	Y	
<i>Podiceps auritus</i>	Horned Grebe	Grèbe esclavon	Waterbird	Y	Y	Y
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Grèbe à bec bigarré	Waterbird	Y	Y	
<i>Podiceps grisegena</i>	Red-necked Grebe	Grèbe jougris	Waterbird	Y	Y	
<i>Larus delawarensis</i>	Ring-billed Gull	Goéland à bec cerclé	Waterbird	Y	Y	
<i>Grus canadensis</i>	Sandhill Crane	Grue du Canada	Waterbird	Y		
<i>Porzana carolina</i>	Sora	Marouette de Caroline	Waterbird	Y		
<i>Rallus limicola</i>	Virginia Rail	Râle de Virginie	Waterbird	Y		
<i>Aechmophorus occidentalis</i>	Western Grebe	Grèbe élégant	Waterbird	Y	Y	Y
<i>Anas americana</i>	American Wigeon	Canard d'Amérique	Waterfowl	Y	Y	Y
<i>Bucephala islandica</i>	Barrow's Goldeneye	Garrot d'Islande	Waterfowl	Y	Y	Y
<i>Anas discors</i>	Blue-winged Teal	Sarcelle à ailes bleues	Waterfowl	Y		
<i>Bucephala albeola</i>	Bufflehead	Petit Garrot	Waterfowl	Y	Y	Y
<i>Branta canadensis</i>	Canada Goose	Bernache du Canada	Waterfowl	Y	Y	Y
<i>Aythya valisineria</i>	Canvasback	Fuligule à dos blanc	Waterfowl	Y	Y	
<i>Anas cyanoptera</i>	Cinnamon Teal	Sarcelle cannelle	Waterfowl	Y		Y

Table A1 continued

Scientific name	English name	French name	Bird group	Breeding	Wintering	Priority
<i>Bucephala clangula</i>	Common Goldeneye	Garrot à oeil d'or	Waterfowl	Y	Y	
<i>Mergus merganser</i>	Common Merganser	Grand Harle	Waterfowl	Y	Y	
<i>Anas strepera</i>	Gadwall	Canard chipeau	Waterfowl	Y	Y	
<i>Anas crecca</i>	Green-winged Teal	Sarcelle d'hiver	Waterfowl	Y		
<i>Histrionicus histrionicus</i>	Harlequin Duck	Arlequin plongeur	Waterfowl	Y		Y
<i>Lophodytes cucullatus</i>	Hooded Merganser	Harle couronné	Waterfowl	Y		Y
<i>Aythya affinis</i>	Lesser Scaup	Petit Fuligule	Waterfowl	Y		Y
<i>Anas platyrhynchos</i>	Mallard	Canard colvert	Waterfowl	Y	Y	Y
<i>Anas acuta</i>	Northern Pintail	Canard pilet	Waterfowl	Y	Y	
<i>Anas clypeata</i>	Northern Shoveler	Canard souchet	Waterfowl	Y		
<i>Mergus serrator</i>	Red-breasted Merganser	Harle huppé	Waterfowl	Y		
<i>Aythya americana</i>	Redhead	Fuligule à tête rouge	Waterfowl	Y		
<i>Aythya collaris</i>	Ring-necked Duck	Fuligule à collier	Waterfowl	Y		Y
<i>Oxyura jamaicensis</i>	Ruddy Duck	Érismature rousse	Waterfowl	Y		
<i>Cygnus buccinator</i>	Trumpeter Swan	Cygne trompette	Waterfowl	Y		Y
<i>Melanitta fusca</i>	White-winged Scoter	Macreuse brune	Waterfowl	Y		Y
<i>Aix sponsa</i>	Wood Duck	Canard branchu	Waterfowl	Y		

## Appendix 2

### ***General Methodology for Compiling the Six Standard Elements***

Each strategy includes six required elements to conform to the national standard. An extensive manual (Kennedy et al. 2012) provides methods and other guidance for completing each element. The six elements provide an objective means of moving towards multi-species conservation efforts that are targeted to species and issues of highest priority. The six elements are:

- 1) identifying priority species – to focus conservation attention on species of conservation concern and those most representative of the region
- 2) attributing priority species to habitat classes – a tool for identifying habitats of conservation interest and a means of organizing and presenting information
- 3) setting population objectives for priority species – an assessment of current population status compared to the desired status, and a means of measuring conservation success
- 4) assessing and ranking threats – identifies the relative importance of issues affecting populations of priority species within the planning area as well as outside Canada (i.e., throughout their life-cycle)
- 5) setting conservation objectives – outlines the overall conservation goals in response to identified threats and information needs; also a means of measuring accomplishments
- 6) proposing recommended actions – strategies to begin on-the-ground conservation to help achieve conservation objectives.

The first four elements apply to individual priority species, and together comprise an assessment of the status of priority species and the threats they face. The last two elements integrate information across species to create a vision for conservation implementation both within Canada and in countries that host priority species during migration and the non-breeding season.

### **Element 1: Species Assessment to Identify Priority Species**

The Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each subregion. The priority species approach allows management attention and limited resources to focus on those species with particular conservation importance, ecological significance and/or management need. The species assessment processes used are derived from standard assessment protocols developed by the four major bird conservation initiatives.<sup>1</sup>

The species assessment process applies quantitative rule sets to biological data for factors such as:

- population size,
- breeding and non-breeding distribution,

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<sup>1</sup> Partners in Flight (landbirds), Wings Over Water (waterbirds), Canadian Shorebird Conservation Plan (shorebirds), North American Waterfowl Management Plan (waterfowl).

- population trend,
- breeding and non-breeding threats, and
- regional density and abundance

The assessment is applied to individual bird species and ranks each species in terms of its biological vulnerability and population status. The assessments can be used to assign sub-regional (i.e., provincial section of a BCR), regional (BCR) and continental conservation needs among birds.

In BCR 10, a species was considered as “regularly occurring” within the BCR and assessed for priority status if there are 10 or more records in the past 10 years, occurring every year or almost every year. Records were obtained from Partners in Flight, *The Birds of British Columbia* (Campbell et al. 1990, 1997, 2001), the BC BIRDS database (Wendy Easton, CWS-PYR), preliminary data from the [British Columbia Atlas of Breeding Birds](#), the *Atlas of Breeding Birds of Alberta: A Second Look* (Federation of Alberta Naturalists, 2007), [eBird Canada](#), and [Christmas Bird Count \(CBC\) data](#). Federally or provincially listed species were also considered, even if there were fewer than 10 records.

Priority species were initially identified based on the following two criteria: (a) whether they were listed by the pillar plans for the species group (landbirds, waterbirds, shorebirds, waterfowl) or (b) whether they were designated “At Risk” by provincial or federal processes. Landbirds, waterbirds and shorebirds were also added to the list as species of regional concern or stewardship based on the criteria outlined below. The resulting initial list of priority species was then screened by local experts, and additional species of conservation concern were added to the list.

### **Partners in Flight Criteria for Landbirds**

Landbird species identified as being of Continental Concern or Stewardship in BCR 10 by the PIF species assessment database (Rocky Mountain Bird Observatory 2005) were added to the priority list in the Canadian portion of BCR 10.

The process for identifying Regional Concern and Regional Stewardship landbird species in the Canadian portion of BCR 10 included a reassessment of the BCR 10 Threats to Breeding (TB), Threats to Non-breeding (TN), and Population Trend (PT) scores appearing in the 2005 PIF species assessment database to reflect data specific to the planning area. TB and TN scores were reassessed by local experts, and PT scores were reassessed based on 1968-2007 Breeding Bird Survey trend data for the Canadian portion of BCR 10 and the PT scores criteria described in The Partners in Flight Handbook on Species Assessment (Panjabi et al. 2005). Where a change in score was made, the highest of the BCR-wide and sub-BCR scores was retained. New Regional Combined Scores for the breeding (RCS-b) and non-breeding (RCS-n) seasons were calculated using Breeding Distribution (BD), Non-Breeding Distribution (ND), Population Size (PS), Breeding Relative Density (RD-b) and global PT scores from the PIF species assessment database, Non-breeding Relative Density (RD-n) scores provided by Peter Blancher (CWS-National), and TB, TN, and regional PT scores from the regional reassessment (see formulas below).

Birds that occur in the Canadian portion of BCR 10 only during the breeding season:

$$RCS-b = BD_{global} + PS_{global} + PT_{BCR\ 10} + TB_{BCR\ 10} + RD-b_{BCR\ 10}$$

Birds that occur in the Canadian portion of BCR 10 only during the non-breeding season:

$$RCS-n = ND_{global} + PS_{global} + PT_{global} + TN_{BCR\ 10} + RD-n_{BCR\ 10}$$

Birds that occur in the Canadian portion of BCR 10 during both the breeding and non-breeding seasons (residents):

$$RCS-n = ND_{global} + PS_{global} + PT_{BCR\ 10} + TN_{BCR\ 10} + RD-b_{BCR\ 10}$$

The criteria used by Panjabi et al. (2005) for identifying Regional Concern and Regional Stewardship species were then applied to prioritize species in the Canadian portion of BCR 10 (see below).

Regional Concern: Species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High Regional Threats (> 3) or Moderate Regional Threat (3) combined with significant population decline (PT > 3)
- Occurs regularly in significant numbers in the BCR, i.e., RD > 1

Regional Stewardship: Species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High importance of the BCR to the species; % of Western Hemisphere Breeding Population in BCR 10  $\geq 25$  OR (RD=5 and % of Western Hemisphere Breeding Population in BCR 10  $\geq 5$ ). **Note:** The % of Western Hemisphere Breeding Population was used here as opposed to the % of Global Breeding Population because Global Population data were not available for most non-landbirds.
- Future conditions are not enhanced by human activities, i.e., Threat Score > 1

### Waterfowl

For waterfowl, the prioritization by the 2004 Strategic Guidance to the North American Waterfowl Management Plan: Strengthening the Biological Foundation (North American Waterfowl Management Plan, Plan Committee 2004) was used as a criterion for identifying waterfowl priority species in the Canadian portion of BCR 10. Species that scored Moderate High, High or Highest for either Breeding or Non-breeding Need in WCR 10 in the NAWMP prioritization were selected as priority species.

### Waterbirds and Shorebirds

Unlike waterfowl, the pillar plans for waterbirds and shorebirds reflect a national scope and do not list priority species by region and unlike landbirds, no standardized methods exist to adjust species lists to reflect species of regional concern or stewardship. We have therefore

developed a technique to allow for the assessment of waterbirds and shorebirds at a regional scale. These methods are loosely based on those developed by Schonewille et al. (2007) but were somewhat modified to reflect the data available in our region.

*For Waterbirds:*

PT, PS, TB, TN, BD and ND scores are taken directly from Wings Over Water Canada's Waterbird Conservation Plan (Milko et al. 2003). Species in categories 1 (highly imperiled) and 2 (high concern) in WOW are automatically added to the priority species list. To regionalize we used the percent of the species range that occurs within the BCR. The percent range scores were calculated using range data from [NatureServe](#) and included the portions of the range where each species is listed as Extant and/or Possibly Present. The categories of data used from NatureServe include:

- Native (year-round)
- Native (breeding season only)
- Native (non-breeding season only)
- Native (as a passage migrant or wanderer)

The highest of the four scores were used to assign the species to one of five categories that reflected the percent of the species' range in the BCR.

- 1—<1%
- 2—1-9%
- 3—10-24%
- 4—25-49%
- 5—≥50%

The regional combined score (RCS\_BCR) is:

$$\text{RCS\_BCR} = \text{PT} + \text{PS} + \text{TB} + \text{TN} + \text{BD} + \text{ND} + \% \text{ Range in BCR}$$

If  $\text{RCS\_BCR} \geq 18$  then the species is added to the priority species list. Species that have a  $\text{RCS\_BCR} \geq 18$  are considered to be regional stewardship species.

There are a number of species of waterbirds that are Information Lacking and do not have scores for PT, PS, TB, TN, BD and ND. In order to assess those species we deferred to the PIF approach for landbirds as described above. For BCR 10, Pied-billed Grebe, Sora and Virginia Rail fell into this category. None were added to the list based on the PIF data and assessment methods.

*For Shorebirds:*

Species in categories 4 (species of high concern) and 5 (highly imperiled) in the Canadian Shorebird Conservation Plan (Donaldson et al. 2000) were automatically added to the priority species list. As above, to regionalize we used the percent of the species' range that occurs within the BCR. If the percent of the species' range in the BCR falls into categories 4 or 5

(above) then the overall score given to the species in the Canadian Shorebird Conservation Plan was increased by one.

If the new score is  $\geq 4$  then the species is added to the priority species list. Species that have  $\geq 25\%$  of their range in the BCR are considered to be regional stewardship species.

### **Species at Risk**

Among the species occurring in the Canadian portion of BCR 10, those that were Red- or Blue-listed in British Columbia, had a status of Endangered, Threatened or Special Concern in Alberta or had a COSEWIC status of Endangered, Threatened or Special Concern were identified as priority species.

### **Screening by Experts**

The list resulting from the assessment described above was screened by experts. Additional species of conservation interest in the planning area were added based on expert opinion.

## **Element 2: Habitats Important to Priority Species**

Identifying the broad habitat requirements for each priority species in the breeding and non-breeding season allows species with shared habitat-based conservation issues or actions to be grouped. If many priority species associated with the same habitat class face similar conservation issues, then conservation action in that habitat class may support populations of several priority species. In most cases, all habitat associations identified in the literature are listed for individual species. In BCR 10, a maximum of two habitat associations were identified for each priority species. Habitat associations do not indicate relative use, suitability ratings or rankings, nor selection or avoidance; this could be a useful exercise to undertake in the future.

In order to link with other national and international land classification schemes and to capture the range of habitat types across Canada, habitat classes for all priority species are based, at the coarsest level, on the hierarchical approach of the international Land Cover Classification System (LCCS) developed by the United Nations Food and Agriculture Organization (FAO 2000). Some modifications were made to the LCCS scheme to reflect habitat types that are important to birds that are not included in the classification (e.g., marine habitats). Species often are assigned to more than one of these coarse habitat classes. To retain the link to regional spatial data (e.g., provincial forest inventories, etc.), or to group species into regionally relevant habitat classes, individual BCR strategies may identify finer scale habitat classes. Finer-scale habitat attributes and the surrounding landscape context were also captured when possible to better guide the development of specific conservation objectives and actions.

## **Element 3: Population Objectives for Priority Species**

A central component of effective conservation planning is setting clear objectives that can be measured and evaluated. Bird Conservation Strategies set objectives based upon the conservation philosophies of national and continental bird initiatives, including the North American Bird Conservation Initiative (NABCI), that support conserving the distribution, diversity and abundance of birds throughout their historical ranges. The baselines for

population objectives used in this planning exercise (those existing during the late 1960s, 1970s, and 1990s for eastern waterfowl) reflect population levels prior to widespread declines. Most of the four bird conservation initiatives under the umbrella of NABCI have adopted the same baselines at the continental and national scale (waterfowl, shorebirds and landbirds; national and continental waterbird plans have not yet set population objectives). Some regions in the current planning effort have adjusted baselines to reflect the start of systematic monitoring. The ultimate measure of conservation success will be the extent to which population objectives have been reached. Progress towards population objectives will be regularly assessed as part of an adaptive management approach.

Population objectives for all bird groups are based on a quantitative or qualitative assessment of species' population trends. If the population trend for a species is unknown, the objective is usually "assess and maintain," and a monitoring objective is set. Harvested waterfowl and stewardship species that are already at desired population levels are given an objective of "maintain." For any species listed under the *Species at Risk Act* (SARA) or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. If recovery documents are not available, objectives are set using the same approach as for other species within that bird group. Once recovery objectives are available, they will replace interim objectives.

For BCR 10, population objectives for waterfowl were taken from the Canadian Intermountain Joint Venture's Biological Foundation and Prospectus (CIJV 2003) and Implementation Plan (CIJV Technical Committee 2010). Population objectives for landbirds, waterbirds and shorebirds were assigned based on the species' population trend (PT) score. For each priority species, the PT score for the entire BCR was provided by Partners in Flight, and the PT score for the Canadian portion of the BCR was calculated from BBS data following PIF protocols (Panjabi et al. 2005). Conservatively, the higher of the two PT scores was used to assign a population objective. Priority species exhibiting declines (PT = 4) were set an objective of "increase population by 50%," while strongly declining species (PT = 5) had an objective identified as "increase population by 100%." For species with PT = 3 (uncertain or unknown trend), objectives were set as "maintain and assess." Finally, species with stable or increasing populations (PT = 1 or 2) had an objective set to "maintain current."

#### **Element 4: Threat Assessment for Priority Species**

Bird population trends are driven by factors that affect reproduction and/or survival during any point in the annual cycle. Threats that can reduce survival include, for example, reduced food availability at migratory stopovers or exposure to toxic compounds. Examples of threats that can reduce reproductive success may include high levels of nest predation or reduced quality or quantity of breeding habitat.



The threats assessment exercise included three main steps:

1. Conducting a literature review to Itemize past, current and future threats for each priority species and classifying the threats following a using a standardized classification scheme (Salafsky et al. 2008).
2. Ranking the magnitude of threats for priority species following a standardized protocol (Kennedy et al. 2012).
3. Preparing a set of threat profiles for the BCR subregion, for broad habitat categories.

Each threat was categorized following the IUCN-CMP threat classification scheme (Salafsky et al. 2008) with the addition of categories to capture species for which we lack information. Only threats stemming from human activity were included in the threats assessment because they can be mitigated; natural processes that prevent populations from expanding beyond a given level were considered and noted, but no actions beyond research and/or monitoring were developed. Threats were ranked by assessing the scope (the proportion of the species' range within the subregion that is affected by the threat) and severity (the relative impact that the threat poses to the viability of the species' populations) of the threat. The scores for scope and severity were combined to determine an overall magnitude low, medium, high or very high. These magnitudes were then rolled up by threat categories and sub-categories across habitat types (see Kennedy et al. 2012 for details on this process). The threats roll up allows for comparison of the relative magnitude of the threats among threat categories and habitat types. The scoring and ranking of threats not only helps to determine which threats contribute most to population declines in individual species, but also allows us to focus attention on the threats with the greatest effects on suites of species or in broad habitat classes.

## **Element 5: Conservation Objectives**

Overall, conservation objectives represent the desired conditions, within the subregion that will collectively contribute to achieving population objectives. Objectives may also outline the research or monitoring needed to improve the understanding of species declines and how to best take action.

Currently, most conservation objectives are measurable using qualitative categories (e.g., decrease, maintain, increase) that will allow an evaluation of implementation progress but they are not linked quantitatively to population objectives. Implementation that incorporates an active adaptive management process is an underlying principle of this conservation effort and will allow for future evaluation of whether or not reaching conservation objectives contributed to achieving population objectives.

Whenever possible, conservation objectives benefit multiple species, and/or respond to more than one threat. However, where necessary, they focus on the specific requirements of a single species.

Conservation objectives generally fall into one of two broad categories:

- habitat objectives within the BCR subregion (the quantity, quality and configuration of priority habitats),

- non-habitat objectives within the BCR subregion (minimizing mortality by reducing predation, conducting education and outreach to reduce human disturbance, etc.)

Ideally, habitat objectives would reflect the type, amount and location of habitat necessary to support population levels of priority species outlined in the population objectives. Currently, there is a lack of data and tools at the BCR scale to develop these specific quantitative objectives. Threats-based objectives present the direction of change required to move toward the population objectives using the best available information and our knowledge of ecosystem management strategies within broad habitat types.

### **Element 6: Recommended Actions**

Recommended conservation actions are the strategies required to achieve conservation objectives. Recommended actions are usually made at the strategic level rather than being highly detailed and prescriptive. Actions were classified following the IUCN-CMP classification of conservation actions (Salafsky et al. 2008) with the addition of categories to address research and monitoring needs. When possible, more detailed recommendations can be included, for example if beneficial management practices, ecosystem plans or multiple recovery documents are available for a subregion. However, actions should be detailed enough to provide initial guidance for implementation.

The objectives for research, monitoring and widespread issues may not have actions associated with them. These issues are often so multi-faceted that actions are best designed in consultation with partners and subject-matter experts. Implementation teams will be better positioned to address these complex issues, drawing input from various stakeholders.

Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but because these strategies are directed at multiple species, actions are usually more general than those developed for individual species. For more detailed recommendations for species at risk, readers should consult recovery documents.

## Appendix 3

### ***Recommendations for the Silvicultural Management of Mountain Pine Beetle-Affected Forests***

(Adapted from Harrison. 2009)

#### **When and Where to Conduct Salvage Logging**

- Do not conduct salvage logging in the short term (3-5 years) while the mountain pine beetle (MPB) is providing an ephemeral food subsidy and the residual habitat structure remains intact.
- Do not conduct salvage harvesting in the non-contributing land base.
- Do not conduct salvage logging in selected areas where intermixed pine represents <40% of the species mix (to maintain habitat for late-seral associated species and maintain stands with lower susceptibility to MPB).
- Limit salvage operations in areas with high residual habitat value:
  - uneven aged stands (i.e., surviving younger trees).
  - stands with surviving non-pine trees (dominant and co-dominant).
  - stands with well-developed shrub layers.
  - ecosystems where biodiversity was high prior to MPB attack.
  - wet ecosystems where residual MPB-killed snags will decay to a degree appropriate for cavity nester habitat.
  - stands with a high residual live-tree component.

#### **What to Retain**

##### *Tree Choice*

- Retain conifer species other than lodgepole pine (to maintain some forest structure in the short term and create less MPB-susceptible stands in the future).
- Retain all possible aspen and other deciduous trees (including dead and dying trees), preferably in patches with conifers (to maintain cavity-nester habitat).
- Retain larger trees (>30 cm will accommodate most cavity nesters).
- Retain a range of size and age classes of dead/dying trees (to ensure sustained provision of dead/dying wood and timely onset of decay).
- Select residual trees that are placed in deep soils, close to riparian areas, or in patches with high snag composition.

##### *Retention Pattern and Size*

- Allocate retention targets to larger uncut reserves, rather than retaining multiple patches within cutblocks, when the maintenance of mature forest-dependent species is a priority.
- Increase retention targets to 30-40% to accommodate harvest-sensitive species.
- Retain trees in an aggregated, rather than a dispersed pattern.

- Keep retention patches to a minimum of 1 ha, and include a few larger patches (>10–50 ha) for mature-forest-dependent species; size of retention patches should increase with decreased proportion of old forest on the landscape.
- Provide small buffers of dead lodgepole pine around retained inclusions of other tree species (to prevent blowdown).
- Follow former Forest Practice Code guidelines when harvesting near streams and rivers (to retain forest patches with the greatest habitat potential).
- Increase the retention area in harvested opening in proportion to the size of the opening.

#### *Additional Legacies*

- Control minor vegetation sparingly (to maintain understory habitat and advanced regeneration).
- Leave any slash >15 cm in diameter where it lies (to provide downed wood habitat).
- Leave standing any trees remaining in clearcuts for woodpecker foraging sites and potential nest trees. If it is necessary to prevent competition with growing seedlings, live deciduous trees can be killed (through herbicide treatments or girdling) but should be left standing.
- Create snags through girdling, topping or stubbing where safety standards permit it and where conditions are appropriate for the creation of cavity nester habitat (i.e., DBH >30cm, deep soil, and moist conditions).
- Preferentially leave/create snags where cavities already exist.

#### *Restoration*

- Refrain from restoration where advanced regeneration of non-pine species exists.
- Do not remove downed wood.
- Focus restoration effort on stands that lack sufficient advanced regeneration (to promote understory development).
- Convert homogeneous pine to non-pine (through planting and non-pine species retention).

#### *Landscape Considerations*

- Balance silvicultural mosaics at a landscape level to mimic natural disturbance patterns, maximize the number of species provided with suitable habitat (since silvicultural options differ in the species they benefit), and minimize the susceptibility of the landscape to future MPB infestation.
- Leave what was originally planned under existing landscape level plans (i.e., provisions for old-growth management areas, since areas with considerable dead pine are still of value to biodiversity).
- Do not change the provisions made for riparian management areas (RMAs) and riparian reserve zones (RRZs).
- Vary amount and pattern of retention with forest type (i.e., what is represented in the surrounding matrix) and natural disturbance pattern.
- Increase the role of prescribed burning as a management tool. Fire, with no salvage, can act as an agent of both beetle control and forest regeneration much more effectively and cheaply than building roads, logging, planting, and other intensive silvicultural activities.
- Extend rotations to allow trees to reach sufficient size to provide appropriate nesting and foraging habitat for cavity nesters.

**[www.ec.gc.ca](http://www.ec.gc.ca)**

Additional information can be obtained at:

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